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USSR Report

MILITARY AFFAIRS

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ARMED FORCES

TEACHING OF RUSSIAN EMPHASIZED

[Editorial Report] Ashkhabad SOVET TURKMENISTANY in Turkmen on 1 August 1984 carries on page 2 a 1,000-word article by A. Makhmanyyasov, first secretary of the TCP Charshangy Raykom, reviewing ideological education efforts and summarising discussions at the recent plenum on "We must make ideological training work reach the level demanded by the XXVIth CPSU Congress." In this regard, "improving the teaching of Russian has great importance." It is noted that despite all efforts, "the teaching of Russian in national schools and the students' level of knowledge are not meeting present demands. Not even all the schools are fully assured of specialists in Russian language and literature, and there has not been enough help and guidance in teaching Russian conversation to those attending preschool childrens' administrations. All strength and means must be directed towards training the younger generation for military service and training them on the basis of the honorable traditions of the Army and Fleet."

COMMANDER CRITICIZED FOR 'DEVALUING' HONOR COURT

[Editorial Report] Moscow KRASNAYA ZVEZDA in Russian on 13 November 1984 publishes on page 2 under the headline "While Jury Is Still Out.... A Tale of Long-Suffering" a 1,200-word article by KRASNAYA ZVEZDA correspondent Lt Col V. Zhitarenko of the Order of Lenin Moscow Military District in which he details the long, and in his opinion inexcusable, delay evident in the discharge of an officer with a known drinking problem. According to Zhitarenko, the commander of the officer's air regiment had on three occasions ignored the recommendations of the Comrade Officers' Honor Court that the officer be discharged. Zhitarenko criticizes the commander for "devaluing" the Honor Court, noting in particular the negative impact this has on other officers who have been charged with wrongdoing.

CSO: 1801/79

DOSAAF

COL GEN AVN KHARLAMOV ON DOSAAF ACHIEVEMENTS, SHORTCOMINGS

Moscow KRYL'YA RODINY in Russian No 8, Aug 84 (signed to press 12 Jul 84) front inside cover-p 1

[Article by Col Gen Avn S. I. Kharlamov, deputy chairman of USSR DOSAAF Central Committee, Honored Military Pilot of USSR, HSU: "The Air Club: Indoctrination on Traditions"]

[Text] The country's Air Fleet Day is a nationwide event. The annals of Soviet aviation are full of truly historic achievements. The red military pilot took an active part in combating the internal counterrevolution and foreign intervention during the Civil War.

The exploit of Soviet aviators in the Great Patriotic War comprises a special page of the combat annals. Like all Soviet military personnel, they displayed mass heroism, staunchness and proficiency in fierce engagements with the invaders. In aerial combat and at airfields they burned two-thirds of the total number of enemy aircraft destroyed at the Soviet-German front.

The exploit of the homeland's winged sons was highly esteemed. There were 2,420 aviators awarded the HSU title, 65 were given this title twice and A. I. Pokryshkin and I. N. Kozhedub were given it three times.

Alumni of the Defense Society played an important role in the enemy's defeat. One-third of pilots, navigators and aircraft gunners awarded HSU gold stars consist of those who began their careers at Osoaviakhim [Society for Assistance to Defense and the Aviation-Chemical Industry] airfields.

By preserving and augmenting the frontlinesmen's traditions, collectives of the DOSAAF air clubs even today are making a substantial contribution toward improving the country's defense potential. Air Fleet Day, which this year is being celebrated on the eve of a prominent date--the 40th anniversary of the Soviet people's victory in the Great Patriotic War--is being greeted by our clubs with new achievements in the preparation of aviation sportsmen and indoctrination of youth in a spirit of Soviet patriotism, socialist internationalism and readiness to come to the Motherland's defense.

Alumni of the Defense Society are setting examples of fulfilling their patriotic duty in the ranks of the Armed Forces. Many soldiers--aviators and

airborne personnel--have been decorated with state awards. Their courage, proficiency and high self-control have been recognized repeatedly. The most outstanding have received the high title of HSU. Col Yu. Churilov, a graduate of the Voronezh Air Club and a first class naval pilot, and Lt Col V. Shcherbakov, a graduate of the Vitebsk Air Club, became wearers of the Gold Star. DOSAAF aviation sports organizations became a springboard for many cosmonauts, including Svetlana Savitskaya, a recordholder and winner of a number of international tournaments.

DOSAAF aviators have serious achievements in technical and applied military sports, with several hundred records and tens of victories in all-union, European and international tournaments to their credit. The attraction of young people to aircraft, helicopter and hang-gliding sport is growing and parachutism is becoming more and more massive. Many aviation sportsmen have been recognized with state awards for high indicators and proficiency. The geography of aviation sport has expanded considerably in connection with the opening of new clubs, especially in areas of the Urals, Siberia and the Far East.

It is a busy time in Defense Society clubs. Training flights, parachute jumps and glider and hang-glider flights are in full swing. Success in preparation of aviation specialists and sportsmen is being decided by the precise efficiency of the entire training and indoctrination process, high discipline and responsibility, and the ability of leaders, instructors and teachers to take up and introduce foremost training and indoctrination forms and methods. Specific deeds represent a criterion for assessing people's activity, which means they are an indicator of work efficiency. There are many aviation collectives in DOSAAF which show stable, high results in performing assigned tasks from year to year. Among them are the Rostov, Alma-Ata, Zaporozhye, Sumy, Saransk and Kinel-Cherkasy clubs.

The ranks of ranking athletes and masters grow systematically in these Defense Society training organizations. For example, the collective of the Kinel-Cherkasy Air Club was awarded the challenge red banner of the USSR DOSAAF Central Committee and the Aviation Industry Workers Union Central Committee several times in a row for victory in socialist competition. Work of the Rostov, Yaroslavl and Zaporozhye clubs also has been recognized with honorary awards. These collectives are setting the example even now, during days of preparation for the glorious 40th anniversary of the Great Victory. Achievements by the foremost collectives are no accident. They are the result of determined work by everyone, from the club chief to the instructor and cadet. Every minute of training time here is accounted for. The young people learn to live and act according to regulations and manuals and they come to know the precision and strictness of military order.

Pilot-sportsmen of Kazakhstan achieved high results. They won an impressive victory in a stubborn struggle at the 8th Summer Games of USSR Nations. Indoctrination on heroic traditions is well arranged and frontlinesmen's exploits are vividly propagandized in the republic's clubs.

Military-patriotic indoctrination is becoming more diversified and profound in content in light of demands of the 26th CPSU Congress and the June 1983 and April 1984 party central committee plenums. Many clubs devote much attention to propaganda of heroic exploits by personnel of the Soviet Armed Forces and by aviators who are alumni of the Defense Society. Abundant material about Heroes of the Soviet Union and other pilots and airborne personnel famed in fighting for the Motherland has been collected and concentrated in combat glory rooms. There are such rooms and museums in the Bryansk, Vitebsk, Rostov, Dnepropetrovsk, Zaporozhye, Odessa and many other clubs.

Meanwhile it must be said frankly that some air clubs still have unresolved tasks and have not done everything to implement in fact the demands set forth by CPSU Central Committee General Secretary, Chairman of the USSR Supreme Soviet Presidium Comrade K. U. Chernenko in a speech at the All-Army Conference of Komsomol workers. Elements of stereotype and formalism have not yet been eradicated in military-patriotic work. The search for new, vivid forms for the propaganda of heroism is being carried on weakly.

These deficiencies are intolerable. Everything must be done to elevate the level of heroic-patriotic indoctrination and persistently implement demands of the CPSU Central Committee Decree on Preparation for the 40th Anniversary of the Great Victory. Meanwhile, some air clubs still are slow in developing this work. The combat glory rooms are being poorly filled with new displays and exhibits. Graphic agitation in some places does not reflect modern demands. A story about how frontlinesmen's traditions are being developed and continued today will not be found in it at times. It would appear that the chief omission in our verbal and visual agitation is the fact that at times it is directed only into the past and is weakly linked with tasks being accomplished today. In the course of daily training and work, many teachers, coaches and instructors do not always skillfully propagandize those who worthily continue the work of frontlinesmen.

Problems of improving military-patriotic work must be the focus of attention for all air club workers. Everything must be done to elevate indoctrinational work to the level of the party's demands.

Clubs also are faced with important tasks in improving the entire training process. More attention should be given to the preparation and training of instructors and teachers. Much has been done here. The comprehensive methodological, theoretical and professional preparedness of instructor personnel is growing. A majority of them are working with vim and to the full extent of their knowledge and experience.

Of course, we also have serious omissions in the professional training of air sportsmen. Some clubs allow oversimplification, and the requirements of documents which regulate flying are not followed everywhere. But flying work brooks no indulgences. Any deviation from strict order, even a slight one, is fraught with serious consequences. The laws of flying practice are rigid. This is why club chiefs and instructors are required to follow all provisions of manuals and instructions strictly and exactly and to take a conscientious

attitude toward discipline, order and exactness. There are tens of aviation organizations in DOSAAF which for many years have had neither flying incidents nor even preconditions therefor.

In some places unfortunately club leaders and flight commanders recently have slackened supervision over precise observance of the laws of flying duty and they themselves have committed very crude infractions of the rules. Such instances occurred in the Ufa, Novgorod, Novosibirsk, Sevastopol, Vologda and Perm clubs. The USSR DOSAAF Central Committee had to take the strictest measures toward violators of order, right down to removal from positions.

Some of our air clubs live and work under equal conditions and they have a good physical facility, identical equipment, experienced cadres of instructors and trained teachers, but results of work in the assigned sector vary. The chief element here is different attitudes toward the job and a differing sense of responsibility on the part of the permanent party. Let's take the Sverdlovsk and Kurgan clubs, for example. The Sverdlovsk personnel are leaders in all indicators. They fulfill the plan on scheduled dates, they fly and they train parachutists with high quality. The collective is distinguished by solidarity and an imaginative attitude toward accomplishing assigned tasks. Club sportsmen successfully perform in zonal and other competitions. Instructors constantly visit enterprises, construction sites, schools and tekhnikums, meet with the young people and tell about their club and its alumni. The result is an influx of fresh forces into aviation sport.

With respect to the Kurgan personnel, there were serious complaints about club leaders. Let's begin with discipline and order. Some instructors and cadets violated the preflight regime, made a superficial study of aviation equipment, and took a formal attitude toward ground training and simulator practices. Poor training indicators in the club were no accidents, and there were preconditions for flying incidents. The club has a large number of flying hours, but the quality of the sportsmen's training leaves much to be desired. The collective worked until recently in isolation from local organizations. Club workers are extremely rare guests at city enterprises and educational institutions. It is true that the situation now has been corrected somewhat, but far from everything has yet been done. There must be intense work until the end of the training year in order to eliminate gaps in the sportsmen's training and indoctrination.

The aviation sportsman is tomorrow's air warrior. We are expecially captious toward the quality of his development and his ideological and physical conditioning. Young boys and girls who cross the threshold of the air club not only must know its combat and sports history, but also become familiar with the names of those who made this club famous, know whom to emulate and from whom to take the example. They must strive to see that cadets take an active part in sports work, develop will, and strengthen the ability to endure physical stresses. We recall the past frontline years when it was necessary to participate in 3-5 air engagements in the course of a day. The winners there were those who possessed good physical conditioning and high mental staunchness.

The present-day international situation is complicated and explosive. Aggressive circles of imperialism headed by the U.S. adventurists continue to build up the arms race. In this situation as never before, the party demands that we have constant vigilance, that we increase the contribution to the country's economic and defense might, and that we continuously strengthen the effectiveness of all our work.

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Soviet authors and the chronicle were prepared from materials of the foreign press. The issue used illustrations from the reference work "Jane's" and from the journals: AVIATION WEEK AND SPACE TECHNOLOGY, ARMED FORCES JOURNAL, ARMY TIMES, JANE'S DEFENCE REVIEW, INTERNATIONAL DEFENSE REVIEW, KAMPFTRUPPEN, PROCEEDINGS, SEA POWER, FLIGHT, FLUG REVUE, AIR INTERNATIONAL and AIR FORCE.

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IMPORTANCE OF MILITARY DISCIPLINE STRESSED

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 6, Jun 84 (signed to press 7 Jun 84) pp 5-8

[Lead article: "Firm Military Discipline Is a Guarantee of High Troop Combat Readiness"]

[Text] A typical sign of today's thoughts and deeds of Soviet citizens is the businesslike efficiency and determination in strengthening the good trends in socialism's development which received a powerful creative impetus at the February and April 1984 CPSU central committee plenums and during work by the 1st Session of the USSR Supreme Soviet, 11th Convocation. CPSU Central Committee General Secretary, Chairman of the USSR Supreme Soviet Presidium, Comrade K. U. Chernenko emphasized the exceptionally great importance of discipline in building a new society and pointed out that "the question of organization and order is a key, fundamental one for us. There cannot be two opinions about this. Any lack of discipline or irresponsibility entails more than just physical costs for society: they inflict serious social and moral harm."

Discipline in a socialist society and its armed forces reflects objective principles of social progress and serves for the strengthening of the most just state system and a victory of communist relationships. V. I. Lenin, who attached extremely great significance to this, wrote that from the moment Soviet power is established, "from the time the socialist revolution begins, discipline must be created on an absolutely new basis." It is necessary for this to be a "discipline of trust . . . , a comradely discipline, a discipline of all possible respect, a discipline of independence and initiative" ("Polnoye sobraniye sochineniy" [Complete Collected Works], XXXVI, 500).

The precise, strict fulfillment of discipline's requirements by every Soviet citizen is one of the manifestations of his participation in building a new society. Under socialism there is a gradual establishment of a conscientious fulfillment of the requirements of discipline, which takes shape as social responsibility based on a communist ideology. Socialist discipline presumes broad initiative, bold and knowledgeable decisionmaking, and the ability to foresee the social consequences of one's actions. Blind subordination to prescribed standards and petty regulation which shackles initiative and restricts

an individual's responsibility are alien to it. Important conditions of conscious discipline are a person's firm, detailed knowledge of his obligations, a high general and professional culture, and the transformation of Marxist-Leninist theory into convictions and the convictions into practical activity.

Soviet military discipline is an inalienable, specific part of a qualitatively new socialist discipline. The USSR Armed Forces Disciplinary Regulation describes it as the strict, precise observance by all servicemen of order and the rules established by Soviet laws and military regulations. Its essence is determined wholly by the social and state system, the nature of our country's military organization, and the content and goal of service in the USSR Armed Forces. On the whole, military discipline has social and moral foundations common to all Soviet state discipline. At the same time, it reflects features resulting from patterns of development of military affairs and the functions and missions performed by the Army. It is a question of one-man command, absolute military obedience, the categorical nature of established legal regulation of military relationships, centralization of control of the Armed Forces, and heightened liability for transgressing servicemen who infringe upon established military order.

Soviet military discipline is one of the principles of the Armed Forces' organizational development. It performs the role of an organizing factor and determines to a considerable extent the correct functioning of the entire military control system. It is chiefly because of military discipline that the Soviet Armed Forces were transformed into a powerful combat body welded by ideals of Marxism-Leninism and by the noble, lofty goal of utter service to their people and to the cause of defending socialism's achievements.

The importance of military discipline grows many times over in today's exceptionally complicated international situation, which demands high vigilance, organization and combat readiness. The aggressiveness of imperialism, and American imperialism above all, stepped up sharply of late, especially with the arrival of the Reagan administration to power in the United States. Having set for itself the goal of "destroying socialism as a sociopolitical system," Washington and its NATO partners are ready to shove the world into the abyss of nuclear catastrophe to achieve that goal. They unleashed an unprecedented campaign of slander against the USSR and other countries of the socialist community, accusing them of nonexistent aggressive schemes and of the desire to establish world domination. Screened by false fabrications about the "Soviet military threat," they themselves are exciting the arms race, drawing up plans for a nuclear attack against socialist states, and stationing Pershing-2 medium range ballistic missiles and Tomahawk cruise missiles in Western Europe. As Comrade K. U. Chernenko remarked in his speech at the All-Army Conference of Komsomol Organization Secretaries on 28 May 1984, reactionary imperialist circles "are attempting to conduct international affairs by operating from a position of strength, and they are trying to disrupt the legitimate course of history. Hence their arms programs which are unprecedented in scope. Hence their persistent attempts to break the strategic military balance."

Under such conditions, continuing a determined and consistent struggle for peace together with other socialist countries, the Soviet Union is taking all necessary steps to keep the Armed Forces' combat readiness at a proper level. High military discipline rightly is called the basis of such combat readiness. "Without firm discipline there is no combat readiness," stated USSR Minister of Defense Mar SU D. F. Ustinov. "This is an axiom known since armies originated. Its truth has been tested by history." Being one of the most important component elements of combat readiness, discipline permeates almost all other components of combat readiness, because the deciding force in war has been and remains man the soldier, who has mastered modern weapons to perfection and who possesses high moral-political qualities, mental staunchness and physical endurance.

Today the collective nature of military discipline is advanced to the fore inasmuch as Soviet soldiers now handle very sophisticated combat vehicles, operate nuclear-powered submarines and supersonic aircraft, and master methods for tactical employment of the latest military equipment. Considerable efforts by all personnel are required in order to achieve high teamwork in actions and to learn to handle modern weapons to perfection.

The discipline of time is becoming an increasingly important factor, since the enormous speeds of modern weapons, troop mobility and the dynamic nature of the situation demand great efficiency. The need to maintain constant combat readiness to repel a surprise attack gave birth to the discipline of operational readiness duty--a very important element which directly affects the personnel's successful performance of assigned missions.

Technical discipline plays a substantial role in combat readiness of Army and Navy forces. The condition of weapons is strictly governed by regulations, orders and instructions, where the slightest deviation from their requirements can lead to disruption of a combat mission. The discipline of command and control at all levels of the complex Army mechanism also is of great importance.

Military discipline is one of the most important means for realizing the indoctrinational function of the Army and Navy. It conditions a young, still unsettled character and teaches collectivism, staunchness and self-control. Young people who have received Army and Navy conditioning give an excellent account of themselves in peaceful labor. Former military personnel set an example of citizenship and efficiency everywhere, at numerous new construction sites, in plant shops, in agriculture and in institute auditoriums.

It must be noted that the discipline of military personnel is very closely related to conditions under which the soldier or sailor serves and with the moral atmosphere in a collective. Strict regulation order, precise organization of the performance of duty, and a good arrangement of combat and political training, the operation of combat equipment, and the personnel's everyday life and leisure are the most favorable conditions for servicemen's exemplary fulfillment of discipline's requirements. Any explanatory measures lose their significance when a unit has no firm regulation order or precise organization

of the personnel's duty, training and life. USSR Minister of Defense Mar SU D. F. Ustinov emphasized that "strict regulation order is above all the exemplary performance of operational readiness duty and guard and interior duties, the precise organization of combat and political training, technically competent operation of materiel, proper relationships of servicemen, precise fulfillment of the daily routine and training plans and programs, concern for everyday life, and intelligent organization of the personnel's leisure and of mass sports work. All these matters constantly must be in the field of view of commanders, staffs, political entities, and the party and Komsomol organizations."

Discipline in our Armed Forces fundamentally differs from discipline in bourgeois armies, where it is imposed by brutal class coercion, deception and ideological brainwashing. The entire system for training servicemen of capitalist countries is aimed at transforming them into robots who mechanically execute the will of their masters. Fear of punishment is the standard of conduct for soldiers of these armies. In the U.S. Armed Forces, for example, the entire tenor of life is based on a crude flaunting of human morality and on implanting thoughtless obedience. A goal-oriented system of violence, brutality and suppression of the individual is dominant here.

The disciplined nature of Soviet soldiers is a conscientious, fully understood attitude, formed on the basis of communist convictions, toward the fulfillment of Soviet laws, demands of the military oath and military regulations, orders of commanders and superiors, and one's own service obligations. Lenin taught that we would not have created the Red Army nor would we have been able to stand up against the onslaught of hordes of the White Guards and interventionists without conscious, iron discipline.

The primary role in strengthening military discipline rests with the officer cadres. Being organizers of the training process and responsible for imposing and maintaining firm regulation order in units and aboard ships, they instil in subordinates each day discipline, execution, precision and military bearing. Combining high exactingness toward people with concern for subordinates and respecting their personal dignity, foremost commanders try to ensure that regulation order reigns in their subunits, there are no disciplinary infractions, and the results of combat and political training are high.

Officers constantly rely in their work on the party organizations, remembering that military discipline is above all a political and moral category and that its foundation is the personnel's ideological conviction and spiritual maturity. By instilling high ideals and political awareness through joint efforts, the commanders and the party and Komsomol organizations use this as a basis to strive for personal examples to be set by all party and Komsomol members without exception in performing their duty and observing the demands of discipline.

Young officers, who often lack experience and the ability to properly arrange relationships with subordinates and rely in their work on party and Komsomol members and the lower ideological aktiv, need special attention on the part of senior commanders, political entities and the party and Komsomol organizations.

The sure path for young officers' development is patient indoctrinational work with commanders at the platoon and company levels, businesslike help in their acquisition of pedagogic and methods skills, effective use of disciplinary rights, and a combination of measures of persuasion and coercion.

The practice of those officer-administrators who teach young officers the ability to thoroughly analyze the status of military discipline in the subunits and who help choose the correct methodology for applying disciplinary rights are deserving of all possible encouragement. It is very important to convincingly prove the harm from instances of administration by mere injunction, reprimands, dressings-down, moral admonitions, and tactlessness in imposing punishments. Officers are convinced from example that all this is a hindrance in delving into subordinates' minds and favorably influencing their reason and feelings.

The largest detachment of our command cadres--warrant officers [praporshchiki and michmany], petty officers and sergeants--must be encompassed by party-political influence. According to the precise expression of M. V. Frunze, the junior command personnel are that basis on which rests the entire matter of discipline, combat cohesiveness and combat training of the unit. Our Army preserves many examples of the selfless performance of military duty by junior commanders. They often replaced fallen officers in combat, skillfully managed subordinates and boldly led them into an attack against the enemy. Every fourth person among Heroes of the Soviet Union who were given this high title during the Great Patriotic War was an NCO. In the Ground Forces alone the names of more than 50 of them have been entered in the personnel rolls forever. Life has proven that in those military collectives where junior commanders are thoroughly aware of their responsible mission and official functions they truly are the officers' first and reliable assistants in maintaining regulation order and in the personnel's training and indoctrination.

The experience of foremost units and ships indicates that the propaganda and explanation of the USSR Constitution, Soviet laws and demands of the oath and regulations have a special role to play in the work of maintaining military discipline at a proper level. This work is carried on by commanders and political officers, usually in close coordination with entities of military justice. Agitprop groups, agitprop collectives and legal aktivs take an active part in the work. Lecture bureaus of legal knowledge for officers, warrant officers [praporshchiki], privates and NCO's have been set up and are successfully functioning in units everywhere, and military-pedagogic lecture bureaus operate systematically for the NCO's. Lenin readings often are conducted here, where the soldiers become familiar with Lenin's works about the substance and importance of discipline in the life of the party, the state and the Armed Forces and about the need for strict observance of Soviet laws and provisions of the oath and regulations.

The moral indoctrination of servicemen is an inalienable component of the work to strengthen discipline in the Army and Navy. It shapes the personnel's firm convictions that they should follow the principles of communist morality in everything. Activities helping the personnel better understand the principles

of the moral code of a builder of communism and the essence of such concepts as honor, a sense of duty, truthfulness and troop comradeship are skillfully planned and regularly conducted in foremost military collectives.

The level of military discipline and regulation order depend on the forms, directions and methods of the indoctrinational process, the style of management of the process on the part of military councils, commanders, political entities and staffs, the status of the check of execution of orders and directives, and a systems approach toward accomplishing the tasks of strengthening the indoctrinational role of the Soviet Armed Forces. It is only on the basis of the purposeful and planned use of powerful shaping factors which they possess that one can ensure that service in the Army and Navy becomes a wonderful school of military proficiency, moral purity, courage, patriotism, comradeship, and development in young people of a feeling of high responsibility for the fate of socialism and security of the socialist homeland.

For the Soviet soldier, strengthening discipline and regulation order in every way means preparing oneself even now for an exploit. Constantly remembering this and relying on the rich experience they have gained, Army and Navy commanders and political officers steadily improve the personnel's indoctrination in a spirit of firm, conscious discipline. Herein lies a guarantee for successful accomplishment of the responsible mission assigned by the Communist Party for further increasing the combat readiness of the Soviet Armed Forces.

6904
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U.S. NUCLEAR BUILD-UP DESCRIBED, DECRIED

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 6, Jun 84 (signed to press 7 Jun 84) pp 9-14

[Article by Lt Gen I. Perov: "Washington's Nuclear Blackmail"; passages rendered in all capital letters printed in boldface in source]

[Text] From the moment the atomic bomb was developed in the United States until the present day the chief concern of the White House has been the build-up in nuclear potential in order to be constantly "first and foremost" in this area.

In the now far-off spring of 1945 when the Soviet people were bringing nearer the victory over fascist Germany at the cost of many millions of sacrifices, a plan for a new and more destructive nuclear war was being feverishly hatched in higher U.S. military-political bodies against its ally in the anti-Hitler coalition, the Soviet Union. En route to the Potsdam Conference (July 1945) at which the heads of state of the USSR, United States and Great Britain were to discuss very important problems of postwar organization, President Truman declared this about the nuclear bomb in a talk with cabinet members: "If it explodes I will of course have a club for these lads, the Russians and Japanese."

Soon such explosions of American nuclear bombs were carried out over the Japanese cities of Hiroshima and Nagasaki. "This is the greatest thing in history!" exclaimed Truman. ". . . Our capital of two billion dollars paid off! . . . The balance of power in the world has changed radically!"

Since 1946, in accordance with the U.S. law on atomic energy, nuclear weapons have become an independent and the most important element of the war arsenal. They began to be used widely as weapons of pressure in carrying out American imperialism's aggressive plans.

As follows from the memoirs of former U.S. Secretary of War H. Stimson, he "never heard from the president or any other responsible member of government that atomic energy should not be used for military purposes." In discussing questions of nuclear attack weapons with President Truman, J. Byrnes, who was

at that time secretary of state, stated that "the bomb can give us an opportunity to dictate our conditions at the end of the war." The foundations thus were laid for an openly impudent American "atomic diplomacy from a position of strength" directed against the Soviet Union.

On the basis of these assessments of the role and significance of nuclear weapons as given by the U.S. political leadership, the Pentagon immediately began developing plans for conducting a nuclear war against the USSR, where the smoke of fascism's monstrous crimes had not yet managed to clear above the demolished cities and villages.

As early as September 1945 the U.S. Armed Forces Joint Chiefs of Staff prepared Directive No 1496/2, which formulated "first strike" provisions. In November 1945 the Joint Intelligence Committee specifically listed in Document No 329 20 Soviet cities including Moscow against which it was deemed necessary to deliver nuclear strikes first of all.

In 1947 the United States drew up a new plan for delivering atomic attacks, which now listed 100 Soviet cities. A National Security Council [NSC] directive emphasized that in case of all-out war the primary mission assigned would be "above all destruction of the population," and on the whole a limitation or elimination of Soviet, or "Bolshevik," control in the USSR and outside its boundaries. Strategic aviation was the chief means of nuclear attack of that period. In accordance with the plan, it was to drop 133 nuclear bombs, including 20 against targets in the vicinity of Moscow and Gorkiy, 12 for Leningrad, 52 for the Volga and Donbass, and 15 each for the Caucasus, Vladivostok and Irkutsk.

Such aggressive plans were made the basis for the U.S. administration's practical activity. "We must be stronger than all others in the area of nuclear weapons," declared Truman in mid-1949. Such a call from the head of the White House essentially was an order for the Pentagon and the country's military-industrial complex to unwind a new spiral in the nuclear arms race. A fierce struggle broke out among the leading American military monopolies for long-term orders worth many billions.

The American military department conducted a special study on the need for nuclear weapons in which the conclusion was drawn that the delivery of 133 nuclear strikes against the Soviet Union was insufficient to "assure surrender, destroy the roots of communism or sharply weaken the power of the Soviet leadership." Based on these "scientific" conclusions, the Pentagon submitted to the president the grounds for the United States' "real" need for nuclear weapons, which subsequently were fully approved by Congress and by the president.

As a result, by the early 1950's the number of strategic bombers used for carrying atomic bombs increased fourfold (from 60 to more than 250), and by late 1953 there were already 1,000 of them in the U.S. Strategic Air Command [SAC].

Widescale production of nuclear weapons was built up in parallel with the increase in numbers of airborne platforms. Judging from the finding of a special governmental commission, the United States had entered the era of nuclear "abundance" by January 1953.

On the basis of such a rapid growth in means of mass destruction of people, military specialists concluded the need for a "deliberate forcing of the beginning of war with the USSR in the near future," before the Russians developed their own nuclear weapons. At the direction of the head of the American administration, the Pentagon developed a plan for waging such a war against the USSR and countries of people's democracy. It was codenamed "Dropshot."

The elimination of the USSR as a socialist state was the basis of the political and military-strategic goal set in the plan. It was planned to achieve this goal by waging war in the following four phases.

FIRST: Execution of widescale air operations employing nuclear (up to 300 bombs) and conventional weapons for destroying at least 85 percent of the USSR's economic potential. With the outbreak of war American strategic bombers were to begin nuclear bombings of administrative centers, troop concentration areas, supply bases, lines of communication, petroleum production and refining enterprises, electric power stations and many other targets. Subsequently it was planned to deliver both nuclear and conventional strikes to prevent the restoration and functioning of important facilities against which strikes already had been delivered. The length of this phase of the war was set at six months.

SECOND: A continuation of deployment by armed forces of the United States and its western allies (over 160 divisions) for a mass attack against the USSR and countries of the people's democracy in Europe.

THIRD: Conduct of decisive combat actions to seize territory of the Soviet Union and countries of the people's democracy. Decisive objectives were set here: the United States together with the allies were to break the will and capability of the USSR to resist by carrying out a strategic offensive in Europe.

FOURTH: Completion of the enemy's defeat, elimination of the socialist system and establishment of control over all territory of the USSR and its allies.

Another scenario for world war also was envisioned in U.S. imperialism's plans. If the Soviet Union surrendered as early as the first or second phase as a result of the conduct of air and other operations, then missions of the fourth phase of the war, i.e., its occupation, should begin immediately. Assigned for this were 23 divisions of ground forces, 20 air groups and 2 naval carrier task forces, which were to occupy key USSR centers and regions for establishing total American control. For example, it was planned to station seven American ground divisions in the western part of the Soviet Union (two in Moscow and one each in Leningrad, Murmansk, Gorkiy and Kuybyshev), eight in the Ukraine and the Caucasus, five in the Urals, three divisions in

Eastern Siberia, the Transbaikal and Maritime Kray, and one U.S. naval carrier task group each in the Black and Baltic seas.

And so, in addition to the mass annihilation of the Soviet populace by atomic bombers, the plan for waging nuclear war against the USSR envisaged the total occupation of all its territory, which considerably exceeded even Hitler's delirious schemes.

From the very beginning of the U.S. development of plans for nuclear war until the present time, the basis has been the idea of a nuclear first strike. For example, back in the 1940's NSC directives No 30 and No 68 stated: "The military advantages of delivering a nuclear first strike demand that we maintain high combat readiness and that we deliver a strike using all our might as soon as an attack is made on us and, if possible, even before a Soviet attack is delivered."

In the 1950's the United States began development of a new nuclear component--operational-tactical weapons intended for use in local wars, and in Europe above all. For example, NSC Directive No 162/2 emphasized that in case of military actions the United States would examine the possibility of employing nuclear weapons on the very same basis as conventional weapons. Based on this, Pentagon directions emphasized that support of American or allied armed forces with nuclear weapons in an all-out war or a local conflict was one of the most important components of U.S. military might and strategy.

The testing of a nuclear device in the USSR in the late 1940's caused a commotion among American creators of the aforementioned strategy, since this signified the end of U.S. monopoly on possession of nuclear weapons. Moreover, it became obvious that in case the United States unleashed aggression against the Soviet Union, its own territory would no longer be invulnerable. In this connection, in a report to the president Pentagon officials again insisted on an urgent examination of the question of "deliberate acceleration of war against the USSR in the near future" before the Soviet nuclear potential turned into reality. For this reason the elaboration of the next detailed plan for delivering a mass strike against the Soviet Union with consideration for the nuclear forces and weapons at its disposal was completed in early March 1953.

In the spring of 1954 the United States conducted tests of a new thermonuclear weapon with a yield of around 15 megatons. The appearance of a more powerful barbarous weapon entailed new studies for the umpteenth time, but this time on problems of a surprise attack in the thermonuclear era. Its essence lay in development of presidential authority for issuing the order to employ weapons in any region of the world depending on the existing situation. In conformity with one of the nuclear war scenarios, the delivery of a mass attack was envisaged against 118 of 134 major Soviet cities by available American strategic forces.

From year to year the Pentagon continued to "substantiate," and Congress and the president to approve, ever-growing appropriations for development of American strategic forces. As a result, by the late 1950's the SAC order of battle

numbered more than 2,000 strategic bombers and construction unfolded at full speed on a new component of the notorious American "triad"--nuclear-powered missile submarines (it was planned to build 45 SSBN's, of which 29 were to be constantly on combat patrol). In the estimates of American specialists, it was possible to destroy 232 Soviet targets by employing only sea-based nuclear missile forces, "which is enough to destroy all Russia." The total cost of such a program was to be $7-8 billion, with annual expenditures of $350 million. The first "George Washington" Class SSBN departed from the forward American base of Holy Loch in Great Britain for the first combat patrol in the Norwegian Sea in the fall of 1960.

At this same time the widescale deployment of "Minuteman" ICBM's continued in SAC. The Pentagon reported that it was necessary for the United States to have 3,000 such missiles and another 150 "Atlas" ICBM's, 110 "Titans" and some 900 strategic bombers.

The ever-increasing American nuclear arsenal advanced to the foreground the need for the existence of a special strategic target planning staff, which was set up in 1960 under the aegis of the SAC commander. This same body was assigned the mission of developing a unified joint plan for waging nuclear war.

The new B-52 strategic bomber, capable of carrying four 20 MT nuclear bombs, was made operational in SAC in 1955 (over 740 of them were built during a seven-year period). In the late 1950's strategic aviation already had more than 1,850 B-52 and B-47 aircraft in its make-up, based at 65 air bases (40 on U.S. territory and 25 abroad, primarily near Soviet territory). Later the new B-58 and FB-111 supersonic bombers entered the inventory.

The first American missile (with a range of 3,200 km) was tested in 1955 and during 1958-1963 45 American "Jupiter" ballistic missile launchers already were deployed on the territory of Turkey and Italy and 60 "Thor" launchers were deployed in Great Britain.

The "Minuteman-1" ICBM began to be operational in 1962. The refitting of 550 launch silos with the new "Minuteman-3" ICBM (the warhead being a MIRV with three nuclear charges) began in the mid-1960's, and there were 1,054 "Minuteman" and "Titan" ICBM's in the SAC order of battle in 1967.

The U.S. nuclear arsenal increased threefold (from 6,000 to 18,000 weapons) in the shortest possible time. The number of targets planned for destruction on the territory of the Soviet Union and other socialist countries was brought to 2,500. As noted in the foreign press, the present American nuclear war plans already have 40,000 of them, including more than 900 Soviet cities.

With the arrival of the Reagan administration to power in the 1980's a new and even more dangerous spiral of the race both of nuclear as well as conventional arms began. In October 1981 Reagan approved the so-called U.S. "strategic program," intended for the period up to the first half of the 1990's. In the area of development of strategic attack resources it provides for the

development and adoption of qualitatively new weapon systems throughout the spectrum of strategic and operational-tactical nuclear weapons. Their chief distinction from existing weapons will be a significant increase in the accuracy of delivery of more powerful nuclear weapons to the targets and the capability of hitting hardened targets.

The specific plans for the next strategic "final arming" of the United States reduce to the following.

For the ground-based missile forces it is planned to develop and begin deploying in 1986 the new M-X ICBM's. By 1989 it is planned to have 100 such missiles in the SAC order of battle, intended for delivering strikes primarily against enemy launch silos. According to American press data, the accuracy of the M-X ICBM (KVO [circular error probable: CEP] will be 120 m.

Work to develop a new light "Midgetman" ICBM (possibly in a mobile version) will continue in this same period. According to the plan, it should enter the SAC inventory in 1992. It is planned to build a total of 1,000 such missiles. They will have the very same accuracy as the M-X ICBM. The first-strike physical base thus is being strengthened.

A process of arming B-52 strategic bombers with long-range (up to 2,600 km) nuclear cruise missiles began in strategic aviation in 1982. It is planned to arm a grand total of more than 200 aircraft with them. Work will continue to develop more advanced air-launched cruise missiles which should have a greater flight range.

The new B-1B strategic bomber, a cruise missile platform, will enter the SAC inventory in 1986. It is initially planned to build 100 such aircraft, and by the early 1990's American firms plan to develop a new ATB strategic bomber (under the "Stealth" program), the primary feature of which will be a small radar cross-section.

Primary emphasis in sea-based strategic nuclear missile forces has been placed on fulfilling a widescale program for building new "Ohio" Class nuclear missile submarines with 24 "Trident-1" missiles aboard, and with the "Trident-2" from the late 1980's on. The chief advantages of these SSBN's are a greater number of missiles aboard than their predecessors; that operating range of "Trident" missiles which will permit the submarines to perform combat patrol in areas covered by U.S. antisubmarine surveillance systems; high accuracy of target destruction, especially for the "Trident-2" (CEP of 120 m). According to estimates by Pentagon strategists, these qualities will permit more effective use of SSBN's in a first strike. It is planned to build a total of 20-25 of them. At the present time the naval command is activating one squadron of SSBN's stationed at the American base of Bangor (northwestern United States). The first "Ohio" Class submarines already have been conducting combat patrols in the northeastern part of the Pacific since 1983.

Medium range nuclear weapons--"Pershing-2" ballistic missiles and land- and sea-based cruise missiles--are a substantial addition to the U.S. strategic potential.

Deployment of "Pershing-2" missiles began in the fall of 1983 on FRG territory (it is planned to have a total of 108 launchers) with a CEP, as follows from foreign press reports, of around 40 m and a flight time to targets on the territory of the western USSR of 5-6 minutes, which also makes them a first strike resource.

In conformity with a decision by the NATO Council, it is planned to deploy 464 land-based cruise missiles on the territory of Great Britain, Italy, the FRG, the Netherlands and Belgium up to 1988. The high accuracy, low flight altitude and long range also place them among first strike resources.

Widescale deployment of sea-based cruise missiles began in the U.S. Navy aboard nuclear submarines, modernized battleships and other surface combatants of the latest designs. With the very same qualities as land-based missiles, they create a threat for the USSR from all sea axes, according to the Pentagon's concept.

In conformity with plans for further improvement of operational-tactical nuclear resources, the United States plans to equip the "Lance" missiles and 203.2-mm howitzers (they began to be operational in 1981) with neutron warheads, and to do the same for 155-mm howitzers in the mid-1980's.

There also are plans to produce nuclear warheads for "Standard-2" shipboard ZUR [surface-to-air missiles] (the "Aegis" ZRK [surface-to-air missile system]) and for new antisubmarine UR [guided missiles] which will replace the "Asroc" and "Subroc" PLUR [antisubmarine guided missiles] in the late 1980's.

New air-dropped nuclear bombs, including with a switchable yield, will enter the U.S. Air Force inventory.

Pentagon plans in the period 1983-1992 envisage producing a grand total of 17,000 new nuclear weapons for strategic and operational-tactical nuclear forces. The United States will spend at least $300 billion (in 1983 prices) just to carry out Reagan's "strategic program."

As follows from statements by official Pentagon representatives, the chief mission of the new American nuclear strategy "is to assure readiness for conducting war" and the "ability to destroy that number of enemy targets so that the USSR ceases to exist as a viable society."

The danger of Washington's present nuclear blackmail is that each year plans for unleashing and conducting a general or "limited," short-lived or lengthy nuclear war are tested intensively in the largest exercises by American strategic forces. Armadas of strategic bombers really take off in these exercises and actually practice flight routes in the direction of the borders of the Soviet Union and other states of the socialist community, and ICBM and SSBN combat teams receive operational training instructions for the use of nuclear weapons.

The Pentagon plays out matters of preparing for nuclear attack most comprehensively and on a most many-sided basis in exercises such as "Global Shield," which have been conducted annually since 1979. As the foreign press reports, the Air Force command brings in more than 800 aircraft and uses more than 70 air bases for participation in these militaristic demonstrations, during which the following missions are practiced: dispersal of SAC aircraft, performance of air alert duty by B-52 and FB-111 strategic bombers, delivery of conditional nuclear strikes, deployment of airborne command posts and control of strategic forces from them, execution of a simultaneous mass take-off by strategic aviation, and so on. Practice "Minuteman" ICBM launches are conducted during these exercises from U.S. missile ranges, simulating a nuclear missile strike.

Such exercises bear an openly provocative nature, since it is difficult to discern whether or not these are practice or real activities involving preparation for unleashing a nuclear war against the USSR. They often are held with the participation of the higher U.S. military-political leadership, including the president himself. "Ivy League," which took place in March 1982, was such a typical exercise. Control of this "game" was exercised from the White House. Former Secretary of State W. Rogers acted as the president and former CIA director R. Helms played the part of the vice president. With regard to the present White House proprietor, he carefully observed his double's actions and learned the entire script for the preparation and unleashing of a world nuclear catastrophe, and expressed his full admiration for its results when the global nuclear rehearsal was over.

And so all people of the planet clearly see from whence comes the threat to peace; therefore that great scope of the antiwar movement which now has gripped many countries is not accidental.

The Soviet Union is doing everything dependent on it to ward off a nuclear catastrophe from nations of the world and stop the forces of imperialism, and American imperialism above all. But, as noted by CPSU Central Committee General Secretary, Chairman of the USSR Supreme Soviet Presidium, Comrade K. U. Chernenko, the U.S. administration continues to place reliance on military force, on attaining military superiority and on imposing its customs on other people. The combat readiness and vigilance of the Soviet Armed Forces for the purpose of a prompt disruption of schemes by American nuclear maniacs are of exceptionally great importance in this regard.

As stressed by USSR Minister of Defense Mar SU D. F. Ustinov, "the effect of the factor of surprise must be reduced to a minimum so an aggressor has no temptation for the unpunished first use of nuclear weapons. Supreme combat readiness of all branches and combat arms of the Soviet Armed Forces, excellent combat training and military proficiency of every serviceman are a guarantee of our Motherland's security and reliable protection for all countries of the socialist community."

No "pre-emptive strike" by the United States will prevent a totally devastating retaliatory blow and nothing will save the aggressor from retribution should he be first to use nuclear weapons against the USSR and its allies. The rulers in Washington who for so many decades have brandished the "nuclear club" must understand this.

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WEST GERMAN MOUNTAIN INFANTRY DIVISION DESCRIBED

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 6, Jun 84 (signed to press 7 Jun 84) pp 29-34

[Article by Col A. Sergeyev based on views of West German military specialists: "Combat Actions in the Mountains"; passages rendered in all capital letters printed in boldface in source]

[Text] The international situation has become sharply aggravated in recent years, especially with the arrival of the Reagan administration to power in the United States. The military-political leaders of the chief countries of the aggressive NATO bloc, and the FRG above all, which actively supports Washington's militaristic course, have stepped up preparations for war against the USSR and other states of the socialist community. Western strategists assume that such a war may be waged under the most difficult physical geographic conditions, including in the mountains.

In the assessment of the Bundeswehr command, mountains, which occupy a significant part of regions of socialist states bordering on the FRG, can become an arena of active fighting. It therefore is devoting great attention to preparing troops for actions in the mountains. It is believed that mountain infantry troops will be able to be employed most successfully here. The foreign press reports that transition to a new organization and establishment for the Bundeswehr's 1st (8th) Mountain Infantry Division,* intended for conducting combat actions on mountainous terrain independently or together with motorized infantry units [soyedineniye and chast'], was completed in late 1981. It is emphasized that, in addition to mountain infantry subunits, motorized infantry and airborne subunits whose personnel have appropriate training and are outfitted with light weapons and gear can be employed in the mountains.

In the views of West German military specialists, mountain combat actions will be conducted in accordance with general tactical principles, but with consideration for the substantial effect on them of such factors as very rugged

*For the organization of the FRG's mountain infantry division see ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No 2, 1982, pp 33-35--Ed.

relief, a poorly developed road network, abrupt changes in the weather, the screening features of mountains and forests, and so on. They will be distinguished by greater independence inasmuch as units and subunits will have to accomplish missions on scattered, isolated axes, sometimes without proper fire support by assets of the senior commander and adjacent units and even with unstable communications with them. Under these conditions commanders will be required to have a maximum of resourcefulness, initiative and boldness in making and executing decisions. It is believed that success largely will depend here on their swift, decisive and precise actions and on subordinates' execution.

The foreign press notes that small subunits can operate in the mountains (Fig. 1 [figure not reproduced]) since the deployment and maneuver of large units [soyedineniye and chast'] are hindered here. The rapid movement of reserves and assistance given on the part of adjacent units most often will be limited or impossible.

Judging from foreign press reports, mountain combat actions predetermine a need for decentralization of command and control of troops, who will be located on separate, most often isolated, axes tens of kilometers from each other. Under these conditions commanders and staffs will be required to have the ability to plan in detail and precisely organize combat actions. A feature of the control system in the mountains is the establishment of supplementary command posts [CP's] on separate axes in addition to primary command posts, and for them to be staggered in altitude. In the opinion of Bundeswehr specialists, airborne CP's installed in helicopters will find wide application here. On the whole, however, it is recommended that they be located nearer first echelon troops. In case of a possible loss of command and control by means of radio communications (due to the screening effect of mountains), it is deemed necessary to provide for redundancy of control by other means such as those installed in helicopters, by signals and so on. Due to the considerable time for deployment of wire means and the large expenditure of wire, such means will be used primarily on the defense.

In the assessment of the ground forces' command element, the scattered nature of mountain combat actions can have a negative effect on the arrangement of coordination not only with adjacent units, but also with supporting forces and resources. It is recommended that special attention be given in the offensive to coordination with enveloping subunits and tactical airborne forces located ahead, whose chief goals are to seize dominant heights and destroy enemy weapons before the main body attacking from the front reaches them. An important role is set aside for arrangement of coordination with supporting artillery, with tactical and army aviation and with engineer subunits on the defense, and especially during delaying actions.

The general views of the ground forces command on conducting mountain combat actions as well as on organizing certain forms of combat and logistical support are presented below.

Bundeswehr specialists place the ATTACK IN THE MOUNTAINS among the most difficult forms of combat actions requiring thorough preparation of troops and combat equipment, precise coordination and control and effective, comprehensive support. When organizing an attack under such conditions one must thoroughly estimate the terrain and enemy to the entire depth of his combat formations' alinement. Particular attention should be given to the condition of the road network and trafficability of terrain off the roads.

Since the attack is conducted primarily along roads and valleys it is recommended that in making a decision one should designate tactically important terrain sectors (dominant heights, passes, passages and so on) where success of combat will depend on their capture. Preference will be given to an envelopment of the enemy with a delivery of attacks against his flanks or the rear. It is believed that use of helicopters increases the capabilities for moving troops to the rear and the flanks, where they can occupy favorable positions and deliver attacks against the enemy independently or in coordination with enveloping subunits.

If there are no conditions for enveloping the defenders' flanks, it is recommended that a frontal attack be conducted, usually at night, in the fog or under cover of a smoke screen, and that it be begun suddenly without fire support. The line of departure for subunits is set as close as possible to the forward edge of enemy defense. The axis of main attack is placed where the terrain favors maneuver toward the flanks and where there are the shortest convenient approaches to important objectives, seizure of which will determine success of combat.

Width of the zone of attack and depth of unit missions as well as their combat formation's alinement depend on the nature of terrain and assigned missions. It is believed that a motorized infantry division's immediate mission can be the defeat of enemy first echelon units [chast'] and the seizure of passes and other important objectives which provide favorable conditions for subsequent actions. The combat formation is planned to be alined in one or two echelons. It is recommended that reserves (second echelons) be committed for exploiting the main body's success when it has seized favorable terrain sectors and provided outlets to broad valleys and high plateaus.

The foreign military press reports that under ordinary conditions the motorized infantry brigade can attack with a frontage of 8-12 km, the division with 20-30 km and the corps with 40-60 km. The brigade is assigned an immediate mission to a depth of 10-12 km, the division to 20-25 km and the corps to 35-60 km. The average daily rate of troop advance in penetrating an enemy's tactical defense is 25 km and it is 40 km in the operational depth. When units are assigned missions for an attack in the mountains one must consider that the real distance between separate points is approximately $1\frac{1}{2}$ times greater than that measured on a topographic map and an average of one hour for every 300-400 m of ascent and 400-500 m of descent must be added to the time required for covering that distance.

The fact that artillery preparation before the beginning of an attack can begin at a different time on each axis also is among the features of weapon employment. Troop fire support usually is carried out by the method of successive fire concentration. It is recommended that artillery and mortars be attached to units and subunits for destruction of targets and installations on their axis of attack. Enemy weapons are neutralized in all tiers of his defense, especially in the lower tier.

The use of tanks, BMP's [infantry fighting vehicles] and APC's is limited in an attack, but they are used where possible for close support of the troops. On very rugged terrain they usually are located in the second echelon in readiness for immediate commitment to exploit success.

Judging from foreign press data, an important role is given to helicopters in an attack in the mountains. They are planned for use to conduct reconnaissance, to move personnel and weapons, to land tactical airborne forces, to move reconnaissance-sabotage groups and deep reconnaissance groups into the enemy rear, to supply troops, to evacuate the wounded and so on. It is believed that the ruggedness of mountain relief contributes to effective use of helicopters for troop fire support and for combating armored targets and destroying other objects on the battlefield. In addition, pack animals are used in some instances for delivering materiel (Fig. 2 [figure not reproduced]).

When preparing for an attack in the mountains there must be a thorough check of the technical condition of combat equipment and motor transport, with special attention paid to serviceability of brake systems and to see that vehicles have a complete set of tow cables, wheel chains and so on. It is also planned to have increased stores of appropriate fuels and lubricants. When loading motor transport, helicopters and other means it is recommended that consideration be given to a reduction in their engine power as they ascend. Columns on the march are formed so as to be in constant readiness for commitment, for which purpose the engineer subunits, artillery and, where possible, tanks are moved forward and air defense weapons are dispersed throughout the column.

According to views of the Bundeswehr command, DEFENSE IN THE MOUNTAINS is organized depending on the nature of terrain, importance of the defended installations and presence of the attacking enemy's forces and resources. The defense is arranged as usual in low mountains, broad valleys and on high plateaus. The West German military press notes that under these conditions a motorized infantry division can occupy a defense area up to 40 km wide and deep. Its combat formation usually is alined in two echelons: two motorized infantry brigades in the first (the defense areas are up to 20 km wide and deep) and one tank brigade in the second echelon.

Primary efforts in high mountain areas are concentrated on holding the tactically most important terrain sectors: passes, dominant heights, road junctions, crossings, outlets onto plains and plateaus, gorges, chokepoints and so on. The defense here can bear a nodal character and consist of a system of battalion defense areas and company strongpoints primarily located on hills.

Intervals between them must be covered by the fire of artillery and other weapons, engineer obstacles, minefields and so on. Special attention must be given to setting up a plan of fire and engineer obstacles on avenues of probable tank approach, on approaches to mountain passes and at outlets to valleys and road junctions in order to hinder the deployment of enemy troops and deprive him of freedom of maneuver. It is also recommended that rear areas be reliably screened against actions by enemy airborne forces and tactical air strikes.

The forward edge of defense usually passes along the tactically most favorable terrain sectors and natural lines. If conditions permit, battle outpost positions are set up and delaying lines formed ahead of the forward edge.

In the specialists' opinion, the combat formation of troops in the defense is alined based on the availability of forces and resources with the goal of concentrating main efforts on axes most accessible for an enemy attack. Because of the difficulty troops have in executing a maneuver in the mountains, the specialists recommend reinforcing division first echelon units with the necessary number of tank, artillery, antitank, air defense, engineer and other subunits. The second echelon and reserves are located in the depth of defense near roads or prepared routes of advance in readiness to interdict the most important axes in case of an enemy penetration and to operate against his airborne forces.

Judging from foreign press reports, the fire plan must provide for the organization of deeply echeloned (in range and altitude) fire of all kinds ahead of the forward edge, on the flanks and in the depth, and the concentration of fire in short periods of time on any threatened axis or sector. Weapons are located on hills in many tiers, and they are concealed and dispersed.

It is recommended that the bulk of organic and attached artillery be assigned to first echelon troops. Tanks, PTRK [antitank missile systems], antitank guns and other weapons attached to first echelon subunits are located in company (platoon) strongpoints and air defense weapons are located on dominant heights and on open sectors of terrain along roads and ravines.

The Bundeswehr command believes that helicopters will play a substantial role in the defense. Numerous missions can be accomplished with their help: reconnaissance, spotting of artillery fire from indirect firing positions, mining enemy terrain, moving personnel and combat equipment (Fig. 3 [figure not reproduced]) to threatened defense sectors and so on. The helicopters' role is especially increased in wintertime, when troops in the mountains may be cut off as a result of snowdrifts, ice and avalanches.

Engineer support is given an important place in organizing defense in the mountains. Natural shelters are adapted for this purpose to accommodate personnel and weapons. On approaches to strongpoints, on flanks and at boundaries various manmade obstacles, including explosive obstacles, are emplaced, rock or timber obstructions are arranged, road sections and bridges are prepared for demolition and so on.

COMBAT SUPPORT TO TROOP ACTIONS IN THE MOUNTAINS is organized by all command echelons and includes reconnaissance, defense against mass destruction weapons, antitank, antiaircraft and antilanding defense, screening of flanks and boundaries, and measures for troop camouflage and misleading the enemy.

Of all forms of combat support, foreign military specialists especially single out reconnaissance. Organization and conduct of reconnaissance under these specific conditions requires careful planning of necessary measures by commanders at all levels. It is emphasized that success of combat often depends on the prompt revelation of the enemy's plan, his grouping and routes of advance. Foreign publications state that mountains create considerable difficulties for collecting intelligence and getting it to the command element. At the same time it is noted that if the mountains are covered with forests there are favorable conditions for actions of reconnaissance patrols (platoon or squad), which not only can perform reconnaissance, but also destroy small enemy groups, his nuclear attack capabilities, control points, communications centers and other installations. In addition, data on the enemy is obtained with the help of observation posts set up in all subunits beginning with company and above and equipped with various electro-optical instruments. In addition to these, wide use is made of appropriate instruments of APC's, tanks, infantry fighting vehicles, combat reconnaissance vehicles (see color insert [color insert not reproduced]) and other equipment, as well as special radars.

In the opinion of foreign specialists, mountains, deep gorges and canyons provide reliable protection against mass destruction weapons, but the aftermath of nuclear bursts (slides, forest fires, radioactive fallout and so on) is very dangerous. Here it is much easier to organize antitank and antiaircraft defense. Mountains and forests as well as very rugged terrain facilitate the camouflage of troops and combat equipment, but this is almost impossible under high mountain conditions, especially in winter.

Logistical support to troops in the mountains presents a complicated problem. On the one hand, in the estimate of the ground forces' command, combat actions here require a higher expenditure of supplies; on the other hand, their delivery to the mountains is exceptionally difficult and at times even impossible. Therefore it is recommended that stores of everything necessary be established with the troops ahead of time, for which forward, reserve and intermediate supply bases should be deployed and various means of transportation assigned to them. The supply of units and subunits operating on scattered axes must be autonomous. Means of transportation usually are used collectively, supplementing each other. Movements are accomplished with a large number of transfers from one transshipment base to another. Estimates by foreign specialists show that the transporting of one ton of cargo requires a motor vehicle or a helicopter or 14 pack animals or 50 porters.

The TRAINING OF PERSONNEL for conducting mountain combat actions is carried out under special programs, which include the following lessons: a study of mountain terrain features, tactics of fighting in the mountains, use of special mountain gear (Fig. 4 [figure not reproduced]), giving medical aid and

organizing emergency rescue operations (Fig. 5 [figure not reproduced]), ski and physical training, including the negotiation of steep slopes and ascents. Classes are held under the direction of experienced instructors who have completed special schools.

For example, command and instructor cadres for the 1st (8th) Mountain Infantry Division are trained in a special school (Hammelburg), where they study features of conducting mountain combat actions in summer (17 weeks) and winter (15 weeks). In the 20 years of its existence the school has prepared a large number of NCO's and officers both for the Bundeswehr and for other NATO armies.

According to foreign military press reports, servicemen's practical training in mountain actions is done at special camp courses. As a rule, this includes balancing and moving on a log (including a slippery log), crossing streams over the rocks, negotiating steep ascents (descents) with and without a rope, firing the personal weapon downward from above and vice versa, as well as at high elevations, ski training and so on.

Those basically are the views of West German military specialists on organizing and conducting mountain combat actions.

6904
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APACHE AH-64A FIRE SUPPORT HELICOPTER

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 6, Jun 84 (signed to press 7 Jun 84) pp 34-40

[Article by Lt Col V. Nelin: "American AH-64A Apache Fire Support Helicopter"; passages rendered in all capital letters printed in boldface in source]

[Text] The development and production of combat helicopters is one of the elements of the race in conventional arms in the United States and primary NATO countries. In the assessment of foreign military specialists, the experience of local wars in Southeast Asia and the Near East showed that helicopters carrying contemporary free-flight rocket and machinegun-cannon weaponry are a powerful means for close air support to troops on the battlefield. The further development and tactical use of these machines also revealed their capability of combating tanks as well. Antitank guided missiles [ATGM's] appeared as part of the main weapons. This, in combination with the high mobility and maneuverability of the helicopters themselves, placed them among the most effective means of combating tanks. In particular, as American specialists' studies showed, they are 10-20 times more effective than tanks accomplishing a similar mission in combating armored targets and the modern combat helicopter allegedly is capable of destroying from two to four enemy tanks in a single sortie. In connection with this the foreign press often has begun to call combat helicopters (or fire support helicopters) armed with ATGM's antitank helicopters, which corresponds to their basic purpose.

But it must be noted that the range of missions accomplished by combat helicopters is not limited to the two mentioned above. They also can be employed to escort assault transport helicopters and infantry (motorized infantry) and tank columns, to destroy area targets, and to lay minefields. Judging from foreign press publications, in the near future they will be capable of neutralizing ground air defense weapons (above all the ZRK [surface-to-air missile systems]) and combating enemy helicopters. Such a diversity of missions assigned to combat helicopters, the chief of which continues to be combating tanks, led to the fact that they no longer fit within the framework of previous designations, and the western press more and more often has begun to call them attack helicopters.

It is believed abroad that the specialized Apache AH-64A fire support helicopter (see color insert [color insert not reproduced]) corresponds to this term to the greatest extent. It is intended above all for combating tanks and has been coming into the inventory of U.S. Army Aviation since February 1984. The foreign press notes in particular that it has good performance characteristics, powerful weapons and the latest electronics, which provide for high effectiveness in employing weapons. A set of measures also was taken to improve its survivability. All this led to the fact that this machine's cost already has reached almost $15 million counting R&D expenditures.

Development of a future combat helicopter for the U.S. Army under the AAH [Advanced Attack Helicopter) program was begun in 1973 on a competitive basis by the American firms of Bell and Hughes. After a comparative analysis of test results of experimental models in December 1976, the Hughes helicopter was chosen and was designated the Apache AH-64A. Several deficiencies were identified in it during plant and troop testing of the helicopter conducted up to May 1978 (a total of 700 hours), after which appropriate design changes were made--the volume of the nose pod was increased for on-board equipment, the main rotor shaft was lengthened, the diameter of the tail rotor was increased, swept tips were installed on the main rotor blades to improve their aerodynamics, the tail design was altered, the control system was improved and so on.

Three prototypes of the Apache AH-64A helicopter (Fig. 1 [figure not reproduced]) were handed over to the ground forces in early 1981 for repeat troop tests, which took place in the period from June through September. During the tests there was a check of the helicopter's tactical capabilities, survivability, reliability and operating characteristics. Practice launches of the Hellfire ATGM and free-flight rockets and cannon firing were conducted, and capabilities of on-board target detection gear were assessed. The total flying hours of the three machines were 412. In the estimate of the crews which participated, the tests were rather successful and demonstrated the helicopter's conformity to requirements placed on it, with the exception of rate of climb, which was to be at least 2.3 m/sec with a payload consisting of eight Hellfire ATGM's and 320 rounds for the gun at an altitude of 1,200 m and ambient temperature of 35°C (without counting the effect of the earth). The decision was made in connection with this to install engines of a new modification providing for a 10 percent increase in cumulative power. At the same time Hughes began preparing for subsequent production of this helicopter. Its main characteristics are given on the next page.

Assembly of the first series-produced helicopter was completed in September 1983 and it was handed over to the ground forces in February 1984. The Department of Army plans to purchase a total of 515 such machines, the deliveries of which are to be completed by the end of 1988. The U.S. Marine command also is showing increased interest in the new helicopter. It has a need for some 120 of them today.

DESIGN FEATURES OF THE HELICOPTER AND ITS SYSTEMS. The design of the AH-64A helicopter is executed in a single-rotor arrangement with four-bladed main and tail rotors, a low-aspect wing and a fixed tricycle undercarriage with tail

Weight, kg:	
Empty	4,996
Normal take-off in main version (for combating tanks)[1]	6,665
Maximum take-off	8,000
Maximum take-off with four suspended fuel tanks	9,310
Flying speed,[2] km/hr:	
Maximum	365
Maximum in level flight	300
Maximum cruising	290
Maximum rate of vertical climb, m/sec:	
At sea level	12.7
At 1,200 m and 35°C temperature	4.22
Service ceiling, m:	
With both engines operating	6,100
With one engine operating	3,080
Hovering ceiling, m:	
In ground effect	4,085
Out of ground effect	3,110
Maximum flight range (with fuel reserve in internal tanks), km	690
Ferry range (with four suspended 770 liter fuel tanks), km:	
No wind	2,020
With headwind of 37 km/hr	1,480
Maximum flight duration (with fuel reserve in internal tanks), hours	3.57

1. With weapons including eight Hellfire ATGM's and 320 rounds for the gun.
2. This and subsequent performance characteristics are given under conditions of MSA [international standard atmospheres] at sea level with a take-off weight of 6,665 kg (except for those where other conditions are indicated).

wheel (Fig. 2 [figure not reproduced]). Its fuselage is all-metal of aluminum alloys with a relatively small cross-section, which reduces the radar cross-section. The crew cabin is two-place, with tandem arrangement of seats. The operator (copilot-gunner) is accommodated in the forward seat and the pilot in the rear seat (Fig. 3 [figure not reproduced]), raised 0.48 m for an improved view. The armor protecting the cockpit from below and the sides, and the armor partition between the seats are made of kevlar, a composition material. The operator's cockpit has all necessary instruments and controls for independent performance of flying and landing. A weapons selection and control panel also is located there (Fig. 4 [figure not reproduced]).

The helicopter's wing is unswept and mid-mounted; it has a span of 5.23 m and is supplied with flaps which deflect downward automatically to an angle up to 20° (depending on flight speed and altitude). The flaps can be deflected upward to 45° during a landing in an autorotation mode to offload the wing. There are four weapon attachment points beneath the wing. Pylons with guided and free-flight rockets suspended on them can be rotated upward to an angle of 5° or downward to an angle of 28°.

The vertical tail (fin) is swept and the horizontal tail (stabilizer) is straight, all-moving and low-set. The stabilizer's position is changed automatically, keeping the helicopter's attitude close to horizontal when climbing and descending and when flying at low speed and accelerating to cruising speed by compensating for aerodynamic loads. It is noted that this permits the crew to conduct fire practically without a supplementary correction of the weapon.

The rotor hub is made of aluminum alloy and attached to the fuselage with a fixed hollow shaft, within which the main rotor shaft passes. Its blades are fitted with elastomeric dampers and horizontal hinges. Two two-blade tail rotors are mounted on the left side of the fin, with blades disposed at an angle of 55° and 125° to each other. They are attached to the hub with torsion bars.

The main legs of the landing gear are designed for a normal landing with a vertical rate of descent up to 3 m/sec, and up to 13 m/sec in an emergency situation. It is reported that the helicopter can take off and land from pads with a tilt up to 12° in the direction of its longitudinal axis and up to 15° in the transverse direction. Wheels of the main legs are fitted with hydraulic brakes.

The power plant includes two T700-GE-701 turboshaft engines (each producing 1,696 hp), accommodated in engine nacelles along the sides of the fuselage behind the main rotor hub. They are started with the help of air-turbine starters. The engines have a modular design, which makes it easier to service them under field conditions. A centrifugal air cleaner is installed at the intake of each engine and is used to remove up to 95 percent of sand, dirt and other foreign objects sucked into the air intake, providing for more reliable power plant operation.

The transmission consists of engine reduction gears, main, intermediate and tail rotor reduction gearboxes, as well as connecting shafts, rods and rockers. Lubrication is accomplished by an oil system which includes two independent sets of oil tanks, pumps and oil lines. The most important components are supplied with emergency lubricators which can support transmission operation for 30 minutes after both subsystems are disabled.

The fuel system includes two protected tanks with an overall capacity of 1,420 liters. One of them is located behind the pilot's seat and the other behind the main reduction gearbox. In addition, four suspended 770 liter fuel tanks can be mounted on the helicopter's weapon attachment points (Fig. 5 [figure not reproduced]). The hydraulic system is redundant. The primary and secondary subsystems are independent and serve for control of the main and tail rotors. The second subsystem also is used for controlling the flaps, the auxiliary power plant and a number of other assemblies.

The helicopter control system also is redundant, and the primary rotor control system is hydromechanical, with the reserve being electro-remote. The tail rotor is controlled with the help of two mechanical drives (with rigid and cable runs), separated from each other. The helicopter can continue flying

for 30 minutes with reserve systems operating. As noted in the foreign press, a feature of the control system is the presence of the DASE digital automatic stabilization equipment, which in the opinion of foreign specialists is dictated by the requirement for making flying easier, especially in stress situations such as when hovering between trees at night, and in other situations. It consists of a command system by which a given flight mode is automatically maintained or semiautomatic control is exercised using flying and navigation instruments. In addition the equipment permits preventing the helicopter from entering inadmissible regimes with an abrupt movement of the controls. Its basic element is a computer which forms control signals sent to actuating devices of the control system and to flight instruments. Signals of actual and given parameters determining the helicopter's movement are supplied to the computer for this purpose. Information on the helicopter's course and its angular and horizontal speeds comes from the AN/ASN-143 inertial navigation system, and information about ambient air pressure and temperature, precise air speed, speed components and wind direction comes from special sensors.

HELICOPTER ARMAMENT AND TACTICAL CAPABILITIES. The Hellfire ATGM with semi-active laser homing head is the basic antitank weapon. Up to 16 such missiles can be suspended on the helicopter (four on each underwing pylon). The launcher with four ATGM's weighs 135 kg (Fig. 6 [figure not reproduced]).

As reported in the foreign press, three methods are planned for use of the Hellfire ATGM. In the autonomous method all operations of target detection, launch and missile guidance are performed by the crew. In this instance the helicopter is located on the target line of sight for a rather long time and is subject to increased danger of enemy air defense weapons being used against it. This negative factor is precluded with the remote method of target designation, where the launch of missiles is carried out from indirect positions and laser illumination is done by another helicopter (primarily a reconnaissance helicopter), a drone, or forward air controller from the ground. A so-called pseudoautonomous guidance method also can be used. In this case the missile is launched from an indirect position to the vicinity of the target along a ballistic trajectory. At the calculated moment of time, depending on range to target, the helicopter climbs, detects the armored object and illuminates it.

Instead of ATGM's, each of the underwing attachment points also can accommodate one launcher each, each of which contains 19 70-mm free-flight rockets (NAR) (a total of up to 76). Depending on the type of warhead, the launch weight of one rocket is 8-10 kg and the range of fire is 4-6 km. Launches can be executed singly or in a volley.

A turret mount with a single-barrel M-230 30-mm gun is accommodated in the lower fuselage beneath the operator's seat (the unit of fire is up to 1,200 rounds, the weight is around 45 kg, effective range of fire against ground targets is 3,000 m and rate of fire is 625 rounds per minute). Sectors of fire from the gun are ±110° in azimuth and from +10° to -60° in elevation.

The foreign press notes that the helicopter's tactical capabilities as a weapons system are determined basically by the diversity, quantity and firepower of weapons used, output of the power plant and effectiveness of target detection and weapons control equipment. The performance characteristics of the AH-64A helicopter with standard versions of armament in performing various missions in different TVD's [theaters of military operations] are given in the table.

Performance Characteristics of AH-64A Helicopter

Combat Mission and Conditions for Its Accomplishment	Armament Versions	Flight Characteristics: Cruising Speed, km/hr	Flight Characteristics: Vertical Rate of Climb, m/sec	Flight Characteristics: Endurance, hours
Combating tanks: H = 1,200 m t = +35°C[1]	8 Hellfire ATGM's and 320 rounds for the gun[2]	269	4.22	1.83
H = 1,200 m t = + 35°C	12 Hellfire ATGM's and 540 rounds for gun	263	2.3	1.83
H = 600 m t = +21°C[3]	16 Hellfire ATGM's and 1,200 rounds for gun[4]	261	3.83	2.5
Fire support of ground troops:		265	3.55	1.83
H = 1,200 m t = +35°C	8 Hellfire ATGM's and 1200 rounds for gun			
H = 600 m t = +21°C	8 Hellfire ATGM's, 1,200 rounds for gun and 38 70-mm NAR[5]	269	3.3	2.5
Escort:		272	2.9	1.83
H = 1,200 m t = +35°C	38 70-mm NAR and 1200 rounds for gun			
H = 600 m t = +21°C	70-mm NAR and 1,200 rounds for gun	272	2.78	2.5

1. Estimated conditions for Near East TVD (H is elevation of terrain above sea level and t is ambient temperature at given altitude).
2. Take-off weight of 6,665 kg.
3. Estimated conditions for European TVD's.
4. Take-off weight of 7,880 kg, fuel reserve 92 percent of maximum.
5. Take-off weight of 7,940 kg, fuel reserve 93 percent of maximum.

ON-BOARD ELECTRONICS. The helicopter's sighting-navigation equipment includes the TADS/PNVS electro-optical system, the IHADSS integrated helmet and display sighting system, the AN/ANS-128 Doppler radar, AN/ASN-143 inertial navigation system and radio altimeter.

Two subsystems are included in the set of the electro-optical system, intended for accomplishing tasks of reconnaissance, target designation and flight support at low altitude at any time of day: TADS (Target Acquisition Designation System) and PNVS (Pilot Night Vision System). The first consists of an optical vision device, television camera, infrared set and laser rangefinder-target designator. The latter consists of an infrared set which the pilot uses when flying at night at low altitude. The system's optical elements are mounted on separate gyrostabilized platforms installed in a metal frame located in the helicopter nose (Fig. 7 [figure not reproduced]).

The IHADSS system includes pilot and operator helmet sights as well as information display devices. It is used for remote control of the IHADSS/PNVS system during sighting and for display of the real situation received from the PNVS subsystem and the TADS subsystem infrared set.

The on-board AN/ANS-128 radar allows a determination of the helicopter's position, ground speed, drift angle and other flight parameters. It has a memory which registers coordinates of a source of radio emission (a target) detected in advance (while flying a route), thanks to which the helicopter's gun already will be laid in the necessary direction when it pops up from cover.

The helicopter's communications equipment includes the AN/ARC-114 radio (for both crew members), the AN/ARC-164 and -116 radios (for the pilot) and a scrambler.

MEASURES TO IMPROVE SURVIVABILITY. In addition to such measures as crew armor protection, the use of two independent oil systems, redundancy of the hydraulic system and control system, as well as fuel tank protection, the most important systems and airframe sections have been armored, sufficient structural strength has been provided for withstanding the hits of 12.7-mm armor-piercing/incendiary bullets, and separate accommodation of engines has been used for purposes of improving the helicopter's survivability.

During the helicopter's development, large-size fans driven from the engines initially were installed on it, providing for blow-by of the exhaust nozzles with a strong flow of cold air in order to have protection against missiles with infrared homing heads. Subsequently, however, in connection with the large expenditures of power for driving the fan, this system was rejected and a special nozzle began to be installed on the exhaust cone of each engine. To reduce the helicopter's vulnerability to guided missiles with radar or laser homing systems, a device for detecting laser emission and the AN/APR-39 radar-emission warning receiver were installed on it. In addition, the helicopter is fitted with means of electronic countermeasures (the AN/ALQ-136 for active jamming of ZRK and antiaircraft artillery fire control radars), and automatic equipment for dispensing chaff and infrared decoys.

SELECTED OPERATING CHARACTERISTICS AND CAPABILITIES FOR REBASING THE HELICOPTER. In the opinion of U.S. Army representatives who took part in testing the AH-64A, it has rather high operating characteristics and reliability. Noted among the positive features in particular is the relative simplicity of operation, presence of a built-in trouble detection system, and convenient access to various systems in performing maintenance. The short time for preparing the helicopter for another sortie is considered an important merit. It has been reported, for example, that two persons can fuel it in four minutes, suspend the Hellfire ATGM's in five minutes and suspend four launchers with 76 NAR (or load the gun magazine with 1,200 rounds) in ten minutes.

The plans are to use the C-130, C-141 and C-5 military transport aircraft to carry the helicopter over great distances. One, two or six helicopters respectively can be loaded in them. Their independent movement from the United States to Western Europe over the so-called North Atlantic route also is envisaged, with landings at Goose Bay and Frobisher Bay (Canada), Sondrestrom (Greenland), Reykjavik (Iceland) and Prestwick (Great Britain).

The foreign press reports that in addition to unfolding production of the AH-64A, Hughes did not cease work to improve it. The results of this work will be used in carrying out a modernization program. For example, a main rotor made entirely of composition materials already has been flight-tested. A new cockpit instrumentation with electronic displays and a system which is to reduce vibrations are being developed. The question of employing the Stinger antiaircraft guided missiles aboard the helicopter for destroying air targets is being studied, and development is under way on new homing heads for the Hellfire ATGM (they will permit realizing the so-called "fire and forget" principle), as well as on new hypersonic guided and free-flight rockets, and so on.

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U.S. VULCAN MINING SYSTEM

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 6, Jun 84 (signed to press 7 Jun 84) p 40

[Article by Col (Res) S. Chernov: "American Vulcan Mining System"]

[Text] The U.S. ground forces are developing the Vulcan general-purpose mining system intended for the accelerated laying of antitank or mixed minefields. Its basis is a unit made in the form of a vertical panel with a packet of 40 detachable launching tubes fastened to it, each tube containing six antitank or antipersonnel mines and a propelling charge for firing them. According to foreign military press reports, it is planned to install several such units on organic army aviation helicopters or ground vehicles.

The helicopter version will consist of four units located in pairs on both sides of the machine (see figure [figure not reproduced]). Minelaying is controlled from the helicopter cockpit. The total number of mines in one filling is 960. During mining, the successive ignition of propelling charges occurs simultaneously from both sides at the operator's command and the mines are fired from the tubes and fall in a zone up to 100 m wide. The zone's length can vary and is determined by the mission at hand. It is believed that a minefield of normal density must have one mine per running meter.

It is planned to use antitank and antipersonnel mines in the Vulcan system made similarly to the remotely laid mines of the FASCAM family: the antitank mine will have a small charge with directional effect and a magnetic proximity fuze; the antipersonnel (fragmentation) mine will have an electronic percussion fuze with an actuator in the form of thin nylon threads which scatter aside after the weapon falls to the ground. Both mines are equipped with a self-destruction unit which detonates the mine at a given time after it is laid.

In mid-1983 the U.S. Army command concluded a contract for $10.5 million with Honeywell according to which the firm must conduct preliminary studies over a 2½ year period and develop an experimental model of the Vulcan system for its subsequent tests. As the foreign press reports, the new system should be an addition to the Gator airborne minelaying system now in production, which is designed for use by aircraft of tactical aviation (A-10 attack aircraft and the F-16 multirole fighters). Delivery of the Vulcan system to the ground troops is planned for the late 1980's.

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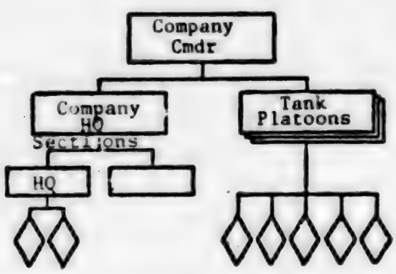
U.S. ARMY TANK, MECHANIZED, INFANTRY COMPANIES DESCRIBED

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 6, Jun 84 (signed to press 7 Jun 84) pp 41-42

[Article: "A Commander's Aid"]

[Text] U.S. Tank Company



Company command element: commander, executive officer, first sergeant

Company totals: officers--5
NCO's and privates--85

A company tactical group of two tank platoons, mechanized platoon and combat engineer squad can be formed in combat on the basis of the tank company. The group may be supported by a battery of 155-mm self-propelled howitzers and by other subunits.

Personnel, Main Weapons	Co Cmd	Co HQ			Tank Platoon	Total in company
		HQ Sect	Main Sec	Total		
Personnel	3	14	13	27	20	90
M60A1 tanks	-	2	-	2	5	17
M113A1 APC's	-	-	1	1	-	1
M203 40-mm AT rckt lncher	-	2	-	2	-	2
M202 66-mm 4-tube rckt lncher	-	1	-	1	-	1
M16A1 5.56-mm auto rifle	-	7	11	18	-	18
M2HB 12.7-mm machineguns	-	1	2	3	-	3
M88 repair-evac vehicle	-	-	1	1	-	1
Radios	-	4	3	7	5	22
Motor vehicles	-	3	2	5	-	5
Colt 11.43-mm pistols	3	5	4	9	20	72
M3A1 11.43-mm submachineguns	-	4	2	6	10	30

Basic Tactical Norms

The tank company of a tank battalion* can fight in the battalion first or second echelon, it can be in its reserve, and it can be attached to a mechanized battalion.

Offensive

The attack frontage of a company is 1.5 km, and that of a platoon is 500-600 m.

A company is assigned an immediate and subsequent missions (objective) to a depth of up to 3 and 5 km respectively.

The company usually alines the combat formations in two echelons, with two tank platoons in the first and one in the second. A single-echelon alinement (line of platoons) also is not precluded.

Possible reinforcement: mechanized platoon, Redeye PZRK [shoulder-fired SAM system] team, combat engineer subunits and other subunits. The company can be supported by a battery of 155-mm self-propelled howitzers.

Defense

A defense area is up to 1.5 km wide and deep, with platoon strongpoints organized within it up to 700 m wide and up to 500 m deep.

A main and an alternate position 150-200 m from each other are organized for tanks, and personnel shelters are organized near them.

The company usually alines the combat formation in two echelons.

Local security is sent out to a distance of up to 500 m from the forward edge.

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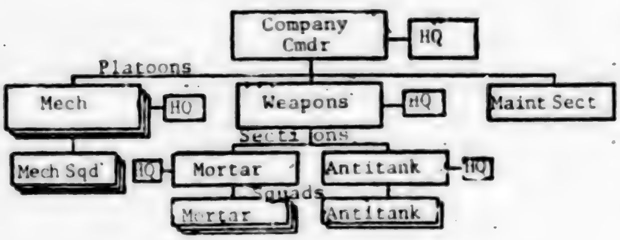
*The tank battalion has five companies (a total of 548 persons): headquarters company, three tank companies and logistical support company. It has 54 M60A1 tanks, 24 M113 APC's, four 106.7-mm self-propelled mortars, five 66-mm four-tube rocket launchers, five Redeye PZRK's and other armament.

U.S. Mechanized Company



Company command element: commander, executive officer, first sergeant

Company totals: officers--6
NCO's and privates--162

A company tactical group consisting of two mechanized platoons, tank platoon and combat engineer squad can be formed in combat on the basis of the mechanized company. The group can be supported by a TOW ATGM section, a battery of 155-mm SG [self-propelled howitzers] and other subunits. For a period of combat the mechanized company forms two weapon groups of 4-5 persons each (commander, rocket launcher operator, submachinegunner, 1-2 riflemen).

Personnel, Main Weapons	Co HQ	Mech Platoon			Weapons Platoon						Main sect	Total in Co
		HQ	Mech Sqd	Total	HQ	Mortar sect Hq/sqd	Mortar sect Total	AT sect Hq/sqd	AT sect Total	In plat		
Personnel	11	5	11	38	3	3/5	20	1/3(4)	8	31	12	168
M113A1 APC's	2	1	1	4	–	1/–	1	–/–	–	1	1	18
Dragon ATGM launchers	–	3	–	3	–	–/–	–	–/–	–	–	–	9
TOW M901 ATGM launchers	–	–	–	–	–	–/–	–	–/1	2	2	–	2
M202 66-mm 4-tube AT rck lnchr	–	1	–	1	–	–/–	–	–/–	–	–	–	3
M203 40-mm AT rocket lnchr	2	–	2	6	–	–/–	–	–/–	–	–	1	21
M125A1 81-mm SP mortars	–	–	–	–	–	1	3	–/–	–	–	–	3
M16A1 5.56-mm auto rifles	9	5	11	38	3	5/3	14	1/1(2)	4	21	11	155
M60 7.62-mm std MG	1	2	1	5	–	1/–	1	–/–	–	1	–	17
12.7-mm MG's	3	1	1	4	–	1/1	4	–/1	2	6	3	24
M578 repair-evac vehicles	–	–	–	–	–	–/–	–	–/–	–	–	1	1
Radios	2	2	1	5	1	4/1	7	–/1	2	10	3	30
Motor vehicles	2	–	–	–	1	1/–	1	–/–	–	2	2	6

Notes: 1. Figures in parentheses indicate number of personnel and weapons in the second squad.
2. Some mechanized platoons may have four Dragon ATGM launchers (12 in the mechanized company).
3. The number of radios is given without consideration of those in vehicles (platoon headquarters--4, mortar squad--2).

Basic Tactical Norms

The mechanized company of a mechanized battalion* can fight in the battalion first or second echelon, it can be in its reserve, and it can be attached to a tank battalion.

Offensive

A company's attack frontage is 1.2-1.5 km, a platoon's is 400-500 m and a squad's is 100 m.

A company is assigned an immediate and a subsequent mission (objective) to a depth of 1.5-2 km and 3-4 km respectively.

The company usually alines the combat formation in two echelons, with two mechanized platoons in the first and one in the second. A single-echelon alinement (in a line of platoons) is not precluded.

Possible means of reinforcement: tank platoon, Redeye PZRK team, combat engineer subunits and other subunits. The company can be supported by a battery of 155-mm self-propelled howitzers.

Defense

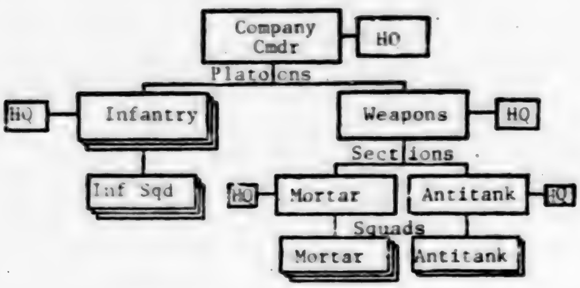
A defense area is up to 1.5 km wide and up to 1.1 km deep. Platoon strongpoints 300-400 m wide and 200 m deep are organized there.

The company usually alines the combat formation in two echelons. Tanks are disposed in the area to provide fire support to the first echelon and to participate in a company or battalion counterattack.

Local security is sent out to a distance of up to 500 m from the forward edge.

*The mechanized battalion has five companies (a total of 880 persons: headquarters company, three mechanized companies and fire support company). It has 69 M113A1 APC's, nine 81-mm and four 106.7-mm self-propelled mortars, 18 TOW ATGM launchers, 27 Dragon ATGM launchers, nine 66-mm four-tube rocket launchers, five Redeye PZRK and other armament.

U.S. Infantry Company



Company command element: commander, executive officer, first sergeant.

Company totals: officers--6
NCO's and privates--163

A company tactical group consisting of two infantry platoons, tank platoon and combat engineer squad can be formed in combat on the basis of the infantry company. The group can be supported by a TOW ATGM section, a battery of 105-mm howitzers and other subunits.

Two weapon groups of 4-5 persons each (commander, rocket launcher operator, 2-3 riflemen) are formed in the infantry squad for the period of combat.

Personnel, Main Weapons	Co HQ	Infantry Platoon			Weapons Platoon						Total in Co
						Mortar Sect		AT Sections			
		HQ	Inf Squad	Total	HQ	HQ/Sqd	Total	HQ/Sqd	Total	In plat	
Personnel	13	8	11	42	3	4/5	19	1/3(4)	8	30	169
Dragon ATGM launchers	-	3	-	3	-	-/-	-	-/-	-	-	9
TOW ATGM launchers	-	-	-	-	-	-/-	-	-/1	2	2	2
M203 40-mm rifle grenade lnchr	2	-	2	6	-	-/-	-	-/-	-	-	20
M29 81-mm mortars	-	-	-	-	-	-/1	3	-/-	-	3	3
M16A1 5.56-mm auto rifles	12	5	11	38	3	4/5	15	1/1(2)	4	20	126
M60 7.62-mm std MG	-	2	-	2	-	-/-	-	-/-	-	-	6
12.7-mm machineguns	1	-	-	-	-	-/-	-	-/-	-	-	1
Radios	5	1	-	1	2	2/1	5	-/2	4	11	19
Motor vehicles	3	-	-	-	1	-/1	3	-/-	-	4	7

Notes: 1. Figures in parentheses indicate the number of personnel and weapons in the second squad.
2. The number of radios is given without counting those in vehicles (platoon headquarters--4, mortar squad--2).

Basic Tactical Norms

The infantry company of an infantry battalion* can fight in the battalion first or second echelon, it can be in its reserve, and it can be attached to a tank or mechanized battalion.

Offensive

The company's attack frontage is up to 1.5 km, and a platoon's is up to 400 m.

A company is assigned an immediate and subsequent mission (objective) to a depth of 1.5-2 km and 3-4 km respectively.

The company usually alines the combat formation in two echelons, with two infantry platoons in the first and one in the second. A single-echelon alinement (in a line of platoons) is not precluded.

Possible means of reinforcement: tank platoon, combat engineer subunit and other subunits. The company can be supported by a battery of 105-mm howitzers with mechanical traction.

Defense

The defense area is up to 1.5 km wide and up to 800 m deep. Platoon strongpoints 300-400 m wide and up to 200 m deep are organized there.

The company usually alines the combat formation in two echelons. The attached tank platoon is used for strengthening antitank defense.

Local security is sent out to a distance of up to 500 m from the forward edge.

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*The infantry battalion has five companies (a total of 800 persons): headquarters company, three infantry companies and a fire support company. It has nine 81-mm and four 106.7-mm self-propelled mortars, 18 TOW ATGM launchers, 27 Dragon ATGM launchers, nine 66-mm four-tube rocket launchers, five Redeye PZRK and other armament.

6904
CSO: 1801/18

FOREIGN RECONNAISSANCE AIRCRAFT

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 6, Jun 84 (signed to press 7 Jun 84) pp 48-52

[Article by Col (Res) B. Ivanov: "Foreign Reconnaissance Aircraft"; passages rendered in all capital letters printed in boldface in source]

[Text] Foreign military specialists regard aerial reconnaissance, which is capable of carrying out systematic surveillance of enemy activity and delivering the collected information to interested parties in short periods of time, as one of the important forms of support to troop combat activities. It is subdivided into strategic and tactical reconnaissance. Missions of conducting strategic aerial reconnaissance are assigned to manned strategic reconnaissance aircraft which presently are in the inventory of air forces of the United States, Great Britain and France.

The United States employs aircraft of three types for these purposes: the SR-71, U-2 (TR-1), and RC-135.

The SR-71A SUPERSONIC HIGH-ALTITUDE RECONNAISSANCE AIRCRAFT (Fig. 1 [figure not reproduced]) was produced until 1968, and a total of some 30 aircraft were built. Such aircraft are in the order of battle of the U.S. Air Force SAC's [Strategic Air Command's] 9th Strategic Reconnaissance Wing (Beale Air Force Base, California), and some of them are stored in storehouses of Lockheed, the manufacturing firm. The SR-71A crew consists of two persons: pilot and navigational-reconnaissance equipment operator. The aircraft has a maximum take-off weight of 77 tons, maximum flight speed of 3,200 km/hr at an altitude of 24 km, maximum range without aerial refueling of 4,800 km, turning radius of 145 km at an altitude of 25 km and a speed of Mach 3, take-off run of 1,200 m with partial fuel load, and a landing run of 1,500 m using a brake parachute. The geometric dimensions are: length 32.7 m, height 5.6 m, wingspan 16.95 m.

The western press notes that the aircraft's airframe is designed for a lengthy flight at a speed of Mach 3, during which skin temperature reaches more than 300°C as a result of aerodynamic heating. Therefore the airframe is made of 70 percent titanium and titanium alloys as well as of composition materials to withstand the great thermal loads. In particular, the wing's upper surface is covered with titanium and plastic tiles which are carefully inspected after

each flight. A complicated system of pumps and lines is used on the aircraft for cooling the skin with a circulating fuel flow.

The power plant consists of two J58-P-4 TRD's [turbojet engines] with a maximum thrust of 11,300 kg each (without afterburning) and 15,400 kg (with afterburning). Specific fuel consumption is 0.8 and 1.9 kg/kg·hr respectively, and each engine weighs 2,950 kg. The control system includes forward and rear engine-air by-pass flaps, sliding intake cones, variable stators and propelling nozzles. In connection with the extreme operating conditions a special oil exceptionally viscous under normal conditions is used in the engines. The JP-7 fuel used (there is an on-board store of some 36 tons of it) is a heat-stable aviation kerosene. Fuel in the engines' main chamber and afterburner ignites only by the chemical method--by injection of triethyl borane into the chamber. Compressed nitrogen is supplied to fuel tanks and compartments with power sources to avoid an explosion.

The primary reconnaissance equipment is accommodated in the nose section of the fuselage. Depending on flight missions, up to five different sets of reconnaissance equipment are used, including aerial cameras (AFA's) for overhead and oblique photography, side-looking radar and infrared equipment. For example, the KS-69A AFA with a lens having a focal distance of 460 mm (picture format of 114 x 1,120 mm) and a side-looking radar capable of conducting surveillance of objects located at a distance of up to 80 km, are used aboard the aircraft. The foreign press notes that using the on-board reconnaissance equipment it is possible to examine some 150,000 km^2 of the earth's surface in one hour's flight from an altitude of 24 km.

Operation of the reconnaissance equipment is connected with an astro-inertial navigation system which is capable of tracking 52 stars, data on which are stored in the on-board EVM [electronic computer], and it permits precise navigation (the maximum error does not exceed 1.85 km in one hour of flight) without using signals from ground radio navigation facilities. During the flight a moving map with the flight route, where the aircraft's actual location is automatically indicated, is continuously projected in front of the pilot and operator.

As a rule the SR-71A takes off with a partial fuel load to avoid the appearance of emergency situations in case one of the engines malfunctions. After taking off and climbing to an altitude of 7,600 m it is refueled from a KC-135Q tanker aircraft. It then moves into a supersonic reconnaissance flight regime, later descends to an altitude of 7,600 m and is again refueled at a speed of Mach 0.9. The exposed film can be dropped by parachute in a container. By successively refueling, experienced crews would make flights lasting a total of up to 10 hours. The western press notes that SR-71A flights place higher demands on a flight crew, and so preflight preparation both of the crew and of the aircraft is complicated. The crew undergoes a medical examination and puts on pressure suits 1½ hours before a sortie. It takes some 30 minutes to put them on and to check out the seal and functioning of the oxygen supply system and the system for cooling and heating the pressure helmet visor. The crew is delivered to the aircraft in a special

vehicle, where pressure suits are connected to a cooling unit. Sitting in the cockpit before a sortie, the crew must breathe pure oxygen for 30 minutes to remove nitrogen from the body in order to reduce the likelihood of high-altitude decompression.

Judging from foreign press reports, in recent years there has been a significant increase in the number of reconnaissance flights by SR-71A aircraft at night using a new airborne radar and optical reconnaissance systems. The work of modernizing the aircraft continues in order to increase reliability and reduce workloads on the crew members. In particular, it is planned to equip it with a new automatic digital flight control system as well as advanced onboard reconnaissance and communications equipment.

The U-2R RECONNAISSANCE AIRCRAFT (Fig. 2 [figure not reproduced]) is in the inventory of the 9th Strategic Reconnaissance Wing. Operating on Pentagon instructions, these aircraft regularly make reconnaissance flights at high altitude in various regions, often violating air borders of sovereign states. The U-2R differs from previous modifications of the U-2 aircraft by the increased wing dimensions, an elongated nose and greater fuel reserve. It has a take-off weight with suspended tanks of 13.1 tons, maximum speed of 690 km/hr at an altitude of 18 km, a service ceiling of 27 km, maximum flight range of some 5,000 km, a length of 19.2 m, a height of 4.9 m, wingspan of 31.4 m and wing aspect ratio of 10.2.

The power plant consists of one J75-P-13B TRD with a thrust of 7,710 kg. The fuel reserve in internal tanks is 4,450 kg. In addition, there are provisions to install two 400-liter fixed fuel tanks. The aircraft has a bicycle undercarriage (one ventral leg with two tires and a steerable tail wheel). Two jettisonable underwing wheel legs are used for taxiing and taking off. Special cockpit glass protects the crew against prolonged ultraviolet exposure. Reconnaissance equipment includes five AFA's with 70-mm film. A periscopic viewfinder is used for viewing the terrain being overflown. It is reported that some U-2R aircraft are fitted with electronic intelligence equipment.

Judging from foreign press reports, there are only eight U-2 aircraft operational at the present time. It is believed that a process line for U-2 assembly, which reopened in 1980, will affect the further fate of this spyplane. American specialists assume that its service life can be extended for another five years. Two U-2R aircraft and one U-2CT trainer were ordered for the U.S. Air Force in 1982. It is noted that in addition to their primary purpose, U-2 aircraft are used to search for aircraft and ships in distress, to take high-altitude air samples, and to assess the grain harvest and the condition of disaster areas. In the opinion of American experts, U-2R flights are fraught with considerable difficulties, among which is the pilot's lengthy stay in a special pressure suit (around 12 hours), the complexity of landing with a bicycle undercarriage without supporting legs, the danger of airframe damage when flying through thunderstorm clouds and the heavy mental stresses on the pilot.

Series production began in 1981 of a new so-called tactical reconnaissance AIRCRAFT, the TR-1A (Fig. 3 [figure not reproduced]), which was made a part of strategic reconnaissance aviation and which is manned and serviced by the very same flight and technical personnel as the U-2R. American military specialists place great hopes on it, believing that with its varied onboard equipment it will be able to provide continuous surveillance of combat zones day and night in any weather conditions while flying in a zone outside the reach of enemy active ground air defense weapons, and pass on collected data in near-real time. It is believed that the TR-1 will be based chiefly on the territories of European NATO countries, making reconnaissance flights along the borders of Warsaw Pact member states.

Judging from foreign press reports, the TR-1 aircraft, developed on the basis of the U-2R, has a similar airframe, power plant and basic onboard systems. Its characteristics include a crew of one person, maximum take-off weight of 18.2 tons, maximum flight range of 4,800 km at an altitude of 21.6 km, and endurance of up to 12 hours. There is no pressurization in the aircraft cockpit and so the pilot must remain in a pressure suit for a lengthy time. The basic reconnaissance and radio navigation equipment weighing a total of some two tons is accommodated in the removable nose and in two wing pods, each 8.2 m long and with a volume of 2.55 m^3. The reconnaissance equipment includes a side-looking radar which provides a view of terrain to a distance on the order of 55 km, as well as other infrared and electronic intelligence equipment.

Thirty-five aircraft have been ordered for the U.S. Air Force, including two two-place TR-1B trainers. It is planned to use ten TR-1A's in the PLSS reconnaissance-attack system for accurate determination of the location of operating enemy radars and for vectoring means of destruction against them. The first series-produced TR-1A aircraft was built in July 1981 and it is planned that purchases of all 35 aircraft will end in 1986. It is planned to station one squadron of these spyplanes at the American air base of Alconbury in Great Britain.

The RC-135 RECONNAISSANCE AIRCRAFT (Fig. 4 [figure not reproduced]) is a refitted C-135B military transport aircraft. At least ten various modifications of the RC-135 aircraft which differ somewhat in external appearance were developed for the U.S. Air Force Strategic Air Command.* The aircraft's take-off weight is 125 tons, empty weight is 46 tons, maximum flight speed is 960 km/hr, the length is 41.5 m, height is 11.68 m and wingspan is 39.8 m. The power plant consists of four J57-P-59 TRD's, each with a thrust of 6,100 kg, or four TF-33-P-5 TRDD's [turbofan engines], each with a thrust of 8,160 kg (depending on the modification).

The western press notes that the RC-135 aircraft are actively used by the Pentagon in so-called peripheral strategic reconnaissance operations; they make lengthy flights along the Soviet Union's borders and collect intelligence

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*For more detail about these aircraft see ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No 3, 1984, pp 57-59--Ed.

by recording and analyzing various sources of electromagnetic emissions. Various equipment is installed in them for this purpose (including the AN/USD-1 and AN/USD-7 signal and electronic intelligence equipment, the AN/ASR-5 system, AN/ALD-5 radio direction-finder, AN/APR-34 receiver and AN/APQ-122 radar). Aerial cameras are used for mapping territory from medium and high altitude. It is also reported that the latest modifications of the aircraft (the RC-135M, U and V) are fitted with an automated electronic intelligence system permitting rapid determination of the location and purpose of enemy radars. Equipment modernization continues at the same time, particularly an improvement in data transmission lines to make them multichannel, jam-resistant and capable of providing communications via ISZ [artificial earth satellite] in real time.

As the western press reports, the American aircraft construction firm of Lockheed is continuing work under a U.S. Air Force contract to develop new strategic means of airborne espionage. For example, its specialists are studying the possibility of developing a strategic reconnaissance aircraft of the 1990's which will have a cruising speed corresponding to Mach 5 at an altitude of 30 km. It is planned to use four combination turboramjet engines operating on liquefied methane as its power plant. It is planned to make the airframe primarily out of titanium alloys in order to withstand the high temperatures of aerodynamic heating, which can exceed 500°C.

The Vulcan-SR.2 and Mirage-4 reconnaissance aircraft are used in the British and French air forces respectively for performing strategic aerial reconnaissance.

The VULCAN-SR.2 STRATEGIC RECONNAISSANCE AIRCRAFT (Fig. 5 [figure not reproduced]) is made on the basis of the Vulcan-B.2 medium bomber. Its primary characteristics are a crew of five, maximum take-off weight of 90 tons, maximum flight speed of 1,180 km/hr at an altitude of 12 km, service ceiling of 19 km, maximum flight range of around 10,000 km, a length of 30.45 m, a height of 8.3 m and wingspan of 33.8 m. The power plant consists of four Olympus-Mk 301 TRD's with a maximum thrust of 9,000 kg each. The Royal Air Force has one strategic reconnaissance squadron which includes eight Vulcan-SR.2's. It is assumed that these aircraft will remain in the inventory until the late 1990's.

Three squadrons of MIRAGE-4A MEDIUM BOMBERS (Fig. 6 [figure not reproduced]) in the French Air Force have been made available from the attack forces and are being refitted as strategic reconnaissance aircraft. It is believed that they are capable of performing aerial reconnaissance from high altitude at a speed of 2,300 km/hr and from low altitude at a speed of 880-1,200 km/hr. The maximum reconnaissance limit without suspended fuel tanks is 1,600 km, but it can be increased to 4,000 km by refueling from the KC-135F tanker aircraft. The two-place reconnaissance aircraft is fitted with two Atar-9K TRD's with a thrust of 7,000 kg each. Its maximum take-off weight is 33.8 tons, maximum speed at an altitude of 11,000 m is 2,350 km/hr, service ceiling is 16,500 m, maximum flight range is 4,850 km, it has a length of 23.2 m, a height of 5.4 m and a wingspan of 11.85 m.

The reconnaissance equipment consists of three AFA's for low-altitude photography, one for a general survey and two for high-altitude photography. The aircraft also are provided with the Supercyclope infrared reconnaissance set, and later they are to be equipped with a side-looking radar with a resolution permitting the detection of moving targets. Its recorder will continuously record the viewed terrain sector 450 km long and 5-7 km wide.

The foreign press notes that in addition to specialized reconnaissance aircraft the U.S. and NATO bloc commands also are making extensive use of AWACS [airborne warning and control system] aircraft such as the American E-3 and British Nimrod-AEW.3; the Orion P-3C and Aurora CP-140 land-based patrol aircraft; the B-52 strategic bombers; heavy military transport aircraft; and even civilian airliners for conducting strategic aerial reconnaissance. In arranging reconnaissance flights, imperialist circles of the United States and NATO concentrate main efforts on obtaining information about facilities located on territories of the Soviet Union and other socialist countries, which attests to their widescale militaristic preparations.

6904
CSO: 1801/18

NEW WASP AIR-TO-SURFACE GUIDED MISSILE

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 6, Jun 84 (signed to press 7 Jun 84) pp 53-55

[Article by Col V. Dmitriyev]

[Text] Having unleashed an arms race unprecedented in scale, the present American administration is setting as its ultimate goal the attainment of military-technical superiority over the Soviet Union in basic kinds of weapons. Having taken this faulty path, the U.S. military-industrial complex is sparing no effort or means in carrying out the work of developing the latest models of weapons and combat equipment.

The WAAM (wide area anti-armor munitions) program, which envisages the development of a number of highly effective tactical means of combating enemy armored equipment and which has been conducted since the late 1970's by the U.S. Air Force command, occupies more than a back seat in this pursuit of the illusory "superiority." As noted in the American press, this program is pursuing the solutions to two fundamentally new tasks from a technical standpoint: development of homing means providing fully autonomous execution of the target search, detection and identification operations and the guidance of weapons to them; and use of warheads in modern weapons with an effect based on the principle of an impact nucleus.

Possibilities of developing antitank munitions employed from clusters or cluster-type launchers were studied initially within the framework of the WAAM program. These were the Cyclops precision-guided munition with an infrared homing head (GSN), which performs a conical scan as it descends on a parachute and, when the target is detected with the help of the GSN, it fires an impact-nucleus charge; the nonadjustable ACM [anti-armor cluster munitions] small caliber bomb with prismatic casing, which when it hits the target or the ground fires three impact-nucleus charges in a horizontal plane and one downward; the ERAM [extended range anti-armor mine] homing mine which, after descending on a parachute and hitting the ground, automatically homes on moving tanks and fires two Skeet precision-guided munitions; and the Wasp air-to-surface guided missile. Judging from foreign press reports, the ERAM mine and the Wasp UR [guided missile] were chosen from this group of munitions as the most promising in early 1983.

It is planned to use the Wasp missile to arm F-16 fighters, A-10 attack aircraft and F-111 fighter-bombers. In addition, the possibility is being studied for employing it from the American A-7D and F-4E aircraft as well as from aircraft of a number of member countries of the aggressive imperialist NATO bloc, including the French Mirage-5, the British Harrier, the Anglo-French Jaguar, the French-West German Alpha Jet and the Anglo-West German-Italian Tornado.

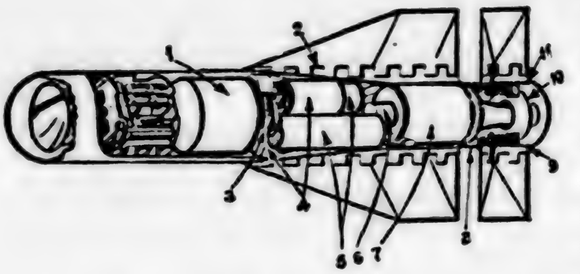

Fig. 1. Configuration of Wasp missile:

1. Warhead
2. Hinged wing
3. Inertial equipment
4. Storage batteries
5. Sustainer engines
6. Safety and actuating mechanism
7. Booster
8. Steering linkage control equipment
9. Steering linkages
10. Compressed air cylinder
11. Control compartment

The Wasp is made according to a normal aerodynamic configuration with tapered sections of a cruciform wing and rectangular tail surfaces which open after launch (Fig. 1). The missile is 1,650 mm long, the body diameter is 200 mm (it decreases to 180 mm in the tail section where wing sections and control surfaces are folded), and weighs 57 kg. The span of wing and control surfaces in the opened position is 628 mm.

A two-mode radar GSN is accommodated in the UR's nose. In the first mode this GSN, which actually is a small coherent pulse-Doppler radar, operates on a frequency of the millimeter band (around 94 GHz), which was chosen for several reasons. First of all, signals at this frequency are propagated with an acceptable attenuation in the atmosphere, including in the presence of smoke, fog and battlefield dust. Secondly, a rather high resolution is achieved in using it, which not only permits picking out armored targets reliably against various backgrounds, but also allows an identification of their type and nature (tank, self-propelled artillery mount, infantry fighting vehicle, wheeled or tracked vehicle and so on). Thirdly, in contrast to the centimeter band, this frequency permits use of a smaller antenna with the very same parameters of the antenna radiation pattern and resolution. In the second mode the GSN operates as a passive radiometer which receives natural target emissions formed at frequencies of around 94 GHz.

The GSN antenna, located beneath a radio-transparent fairing, is a parabolic reflector 150 mm in diameter with an irradiating unit in the form of an open rectangular waveguide. It forms a radiation pattern with a main lobe width of 1.5° and is located together with a transceiver made of semiconductor components on a biaxial gimbal suspension which allows, in the GSN's first operating mode, scanning within limits of ±45° in azimuth with a fixed antenna position of 45° in elevation and, in the second mode, target tracking after lock-on. In addition to target search and identification the radar GSN permits a determination of the slant range, which is used for calculating the

missile's flight altitude. A highly stable heterodyne in the transceiver, which supports its operation with internal coherence, is made as a (Gann) semiconductor diode, and the transmitter's master oscillator is made as an avalanche-flow diode.

The GSN equipment includes a digital processor which accomplishes a number of tasks simultaneously, including the processing of radar signals, production of commands for controlling the aerodynamic surfaces, radar head, autopilot and sustainer engines, monitoring of the serviceability of main components and assemblies, and so on. American specialists believe that the radar signal processing programs stored in the processor determine the fundamental difference of the Wasp UR from existing missiles with a similar purpose inasmuch as it is capable of independently searching for, detecting, identifying and destroying a target. A number of identification algorithms using Doppler moving target selection, as well as a number of discrimination methods based on such parameters as reflected signal power, reflection coefficient of standard targets, the reflected pulse front gradient and relative distance, are realized in the processor in support of this. Such a group of parameters forms a signature for each target in the system, singled out of the GSN's radar signal by the digital processor.

A set of standard signatures for various targets (tanks, self-propelled artillery mounts, infantry fighting vehicles, motor vehicles) which were obtained by lengthy studies under various natural climatic conditions (on wooded, level, desert and other terrain and at all times of year) is entered in the processor's memory unit in digital form. Identification in the processor reduces to comparing the detected target's signature with standard signatures and determining the value of the correlation function. The result is that commands are produced for controlling the GSN radar unit, including for executing a lock-on and shifting to target tracking in a passive radiometric mode by the method of finding the centroid (i.e., determining the phase center of target emission) and, on the final leg of the trajectory, by the autocorrelation method (frame-by-frame comparison of target image with determination of the autocorrelation function).

The digital processor also produces commands for the autopilot (it is located directly behind the missile warhead). If the airborne platform has inertial navigation equipment and a digital data-transmission bus as, for example, on the F-16 fighter, the aircraft's current coordinates, coordinates of the area where the targets are located, and other data necessary for calculations prior to UR launch can be entered into the processor. This information is used in the processor in selecting the missile flight trajectory, which is maintained using the autopilot (such calculations also can be performed by the processor independently based on data of the UR's inertial equipment and the radar GSN).

The propulsion unit of the Wasp missile is a two-mode solid-propellant rocket motor. A modified TOW ATGM [antitank guided missile] motor operating for 1.2 seconds serves in it as the booster stage, and two multiple-start motors serve as the sustainer stage. The UR's engine compartment also contains

storage batteries, which provide electrical power for onboard equipment, and the warhead (BCh) safety-actuating mechanism.

The missile warhead is a shaped charge. Two versions are under development, in one of which the facing of the charge hollow is made of copper and in the other it is made of depleted uranium. The BCh is detonated by a contact fuze. In addition, the possibility is being studied of using a BCh in the missile with an operating principle based on properties of an impact nucleus. To assure the unhindered passage of the hollow-charge jet formed from detonation of the warhead, there is a hole in the center of the GSN unit and the length of the homing head is chosen so as to obtain the necessary hollow-charge effect when the UR hits the target.

It is planned to load Wasp missiles in a suspended launcher (PU) having four tubes with a square cross-section (230 mm on a side). Each tube will contain two missiles separated by a reflecting plate which must protect the fairing of the UR located in the rear and divert the jet stream of the front UR's booster motor into the PU's central exhaust pipe. The unit itself is made of aluminum alloy and has a streamlined shape with a rectangular cross-section 600x600x5,000 mm in size. The PU weighs 816 kg in a loaded condition. After the launch of all UR's it will be jettisoned from the airborne platform. The launcher also serves as a container for factory storage of missiles (for a period of up to ten years) and their transportation.

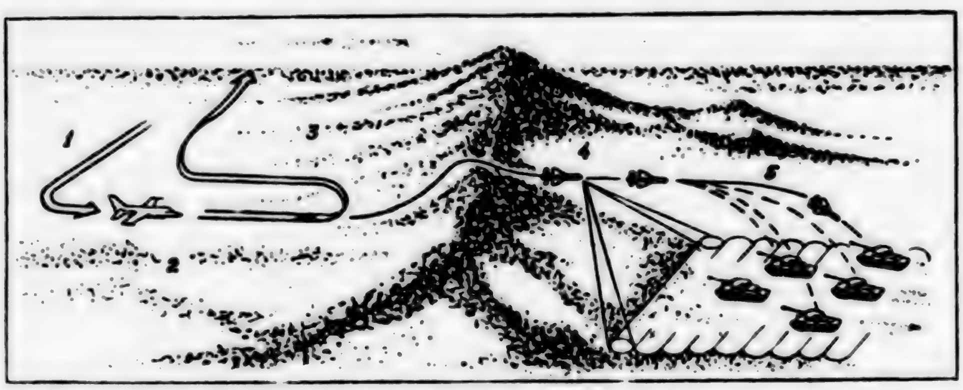

Fig. 2. Diagram showing tactical employment of the Wasp missile:

1. Airborne platform's approach to the attack position
2. Low-altitude flight of airborne platform and missile launch
3. Airborne platform's exit from the attack immediately after missile launch
4. Missile flight at constant altitude in target search mode
5. Locking on, tracking and diving on the target

The tactical employment of the Wasp UR is planned as follows (Fig. 2). After being launched from a range of 10-15 km the missile flies a ballistic trajectory on which the wing sections and control surfaces open up, guidance unit switches on and the safety-actuating mechanism is armed. After being launched against an unobserved target the UR executes a descent or climb maneuver depending on the flight altitude of the airborne platform, then moves to a certain altitude and flies at a speed allowing examination of the necessary terrain area in search of targets by means of an antenna scan in a ±45° sector. The GSN's effective range is over 5 km in clear weather and up to 3 km in adverse weather conditions. The sustainer motors can be switched on and off repeatedly in the middle leg of the trajectory for maintaining a given flight speed, while altitude measurement data using the radar GSN permit making the flight at approximately a constant altitude following terrain relief.

Several methods are provided for separating missiles to different targets in a group launch. First of all, each UR is given its own serial number and they are launched in succession, with the first missile hitting the first detected target, the second hitting the second target and so on. When a target is detected the GSN antenna ceases to scan and shifts to lock-on and tracking of the target in a passive radiometric mode. If several targets are located at the same distance from the GSN during the UR's flight and the search for a target "with its own number," then the target which is to the left of the flight course is selected first of all. After locking on to "its own" target the missile goes into a dive. The processor determines the most vulnerable impact point by means of an appropriate processing of signals being received (for example, it is believed that on the tank such a point is located in the area of the engine compartment).

As the foreign press has reported, competitive development of the Wasp UR began in December 1979 and in late 1981 the U.S. Air Force command chose the firm of Hughes Aircraft as the prime contractor. A contract worth $47.2 million was concluded with that firm, providing for completion of the missile development phase and the conduct of flight tests. It was also reported that these tests confirmed capabilities of the radar GSN to detect moving and stationary lone and group armored targets arranged in one line, in an arbitrary or in a specific combat formation, under conditions of fog and precipitation, against the background of melting and dry snow, and so on.

It was planned to carry out eight launches of the UR with an independent target search in the final development phase which ended in September 1983. The first launch, conducted in March 1983, was a failure because of mistakes made in entering working programs into the onboard processor. Direct hits on a target were obtained in April and May of that same year with missile launches from the F-16 aircraft. Subsequently it is planned to conduct over 500 launches of the UR from the F-16, A-10 and F-111 aircraft, for which 564 missiles and 46 launchers must be manufactured. It is planned to begin series production at a slow rate in late 1985 and to produce large lots in 1988. The estimated cost of a single model of the Wasp missile is $50,000.

6904
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NEW AMERICAN RADIOS FOR FORWARD AIR CONTROLLERS

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 6, Jun 84 (signed to press 7 Jun 84) pp 56-58

[Article by G. Luchko; passages rendered in all capital letters printed in boldface in source]

[Text] American military specialists regard accuracy of approach to the target and identification of the target to be one of the important factors for improving the effectiveness of attack aircraft actions in close air support of ground troops. In their opinion, forward air controllers outfitted with appropriate equipment, including communications radios, can successfully vector aircraft to targets from the ground under conditions of a rapidly changing combat situation and limited visibility.

Judging from foreign press reports, in late 1983 it was planned to make new communications electronics equipment developed under the Pacer Speak program operational in the U.S. Air Force. The equipment includes a radio communications system and a number of individual radios operating in the HF [high frequency] and VHF [very high frequency] bands. The western press notes that this equipment was made on the basis of one transceiver, the RT-1319/URC, which is the central element for all versions of communications radios: the portable AN/PRC-113 and the transportable AN/TRC-176 and AN/VRC-83.

The RT-1319/URC transceiver operates in the 116-150 MHz and 225-400 MHz frequency bands and standby reception is accomplished at a fixed frequency of 243 MHz. Frequency separation is 25 kHz and there are eight pretuned fixed frequencies. The operator can select transmitter power (2 or 10 watts). The transceiver provides telephone and telegraph communications as well as data transmission with amplitude modulation.

A design feature of the RT-1319/URC is the presence of one interface connector by which it is possible to connect a hand microtelephone or scrambler to the transceiver. Key switches on the front panel are used for tuning, frequency selection, calling a subscriber and selecting the operating mode (switching is done automatically). The tuned frequency, number of preset communications channels and operating mode are shown on a liquid crystal display.

A special memory unit in the RT-1319/URC is capable of storing data input to it even after the transceiver is turned off. Because of this there is automatic restoration of the last selected frequency when the "Frequency" button is pressed or when the transceiver is turned on. In addition, there are provisions for remote control of the transceiver, including its being turned on and off.

The AN/PRC-113 MANPACK COMMUNICATIONS RADIO is the aforementioned transceiver with the addition of a power supply unit (battery), antenna and connecting cables (Fig. 1 [figure not reproduced]). The set (it weighs 3.6 kg) is contained in a case 76x234x300 mm in size. It is made in several versions. One of them in particular, the AN/PRC-113-1, is compatible with scrambler equipment in the data transmission mode, but it has no antijam circuitry. The AN/PRC-113-3 version basically is similar to the previous one, but it is equipped with a built-in antijam circuit.

The foreign press reports that the AN/PRC-113-1 is to replace the obsolete SKY-515, AN/PRC-41, -66 and -75 radios presently in the inventory. It is planned to make more than 1,700 AN/PRC-113 sets for the U.S. Air Force.

The TRANSPORTABLE AN/TRC-176 RADIO consists of the RT-1319/URC transceiver, antennas, microtelephone, microphone, remote control unit and connecting cables (Fig. 2 [figure not reproduced]). The transceiver and all auxiliary equipment are accommodated in a case which also has a sound amplifier for a built-in loudspeaker and a power supply source for a communications scrambler device. The remote unit allows the set to be controlled from a distance up to 6 m.

It is assumed that the AN/TRC-176 will replace the AN/TRC-68 set in the inventory (it is planned to produce more than 500 of them for the U.S. Air Force).

The AN/VRC-83 TRANSPORTABLE RADIO includes the RT-1319/URC transceiver, a combination adapter, and connecting cables (Fig. 3 [figure not reproduced]). It has remote control. The adapter, which provides for the necessary signal output level, includes a 30-watt linear amplifier which makes it possible for the operator to select transmission output: 2, 10 or 30 watts. One version, the AN/VRC-83-1, is compatible with a scrambler device and another, the AN/VRC-83-2, also has an antijam circuit. It is planned to use such sets to replace the obsolete AN/VRC-24 (250 will be produced for the U.S. Air Force).

The AN/GRC-206 RADIO COMMUNICATIONS SYSTEM can be installed in various means of transportation, particularly the M151 jeep (Fig. 4 [figure not reproduced]), the M113 APC's and the Hummer multipurpose army vehicles. Depending on the version, the rack with system equipment weighs 140-190 kg. The AN/GRC-206 is made in three versions: with communications scrambler equipment; without it (intended chiefly for export); and with such equipment and with antijam circuitry. The system provides for the following work modes: high frequency [HF] on a single sideband, HF with amplitude modulation, very high frequency [VHF] with amplitude modulation and HF with frequency modulation.

The 2-30 MHz band of frequencies is used for operating in the first mode (280,000 communications channels). This work mode is accomplished using the RT-1209 transceiver (modernized transceiver of the AN/PRC-104 manpack HF radio provided with a remote control device) and HF power amplifier with antenna matching device (modified version of a similar device from the AN/PRC-105 manpack HF radio, 150-watt output power).

This work mode provides telephone communications or data transmission on continuous wave transmission on the lower or upper sideband. The equipment is operated both when the means of transportation in which it is installed is in movement as well as at a halt. In the first instance the flexible AT-1011 HF antenna is used, extended to a height of 5 m; in the second instance, depending on missions to be accomplished, the very same antenna is used, extended to a height of 5 or 10 m, or a long-wire antenna. It is believed that this opportunity for selection permits stable communications over a distance up to 485 km.

The 30-76 MHz band is used for operating in the frequency modulation mode. The transmitter output in this band is 35 watts. Work is accomplished using the RT-246 transceiver and AS-1729 antenna taken from the AN/VRC-12 radio. The transceiver is provided with a remote control device by which it is possible to select one out of ten pretuned operating frequencies and to turn the sound on and off. The RT-524 transceiver, also taken from the AN/VRC-12 radio but without pretuning of frequencies, is installed in another version (the AN/GRC-206-2).

Operation with amplitude modulation in the 116-150 MHz and 225-400 MHz bands is provided by two AN/VRC-83 radios with combination broadband antenna.

Control of all four radios in the radio communications system is accomplished from a standardized console which can be manned by one or two operators using either a standardized or individual console. In the latter instance all operations are controlled by a microcomputer, which precludes contradictory commands.

Commands for activating a particular work mode are mixed with an information signal which is converted into digital form, then the mixed signal is sent to a signal distribution device where it is broken into component elements and the information is converted and sent to the appropriate radio according to the command. When a command for reception is transmitted the process of conversion into analog form takes place in the reverse order. In this mode signals from all four radios can be brought to the console at the operators' desire. If one control console is used for local control and another for remote control, then there is provision for an intercom between the operators. The H-250 hand microtelephone, the DH-132 interphone headset with which combat vehicle crews are outfitted, as well as the PSC-2 digital communications terminal device can be connected to the console.

The foreign press notes that the AN/GRC-206 is the first American system using fiber-optic cables connecting a standardized remote control console with

a signal distribution device. Because of relatively low losses in such cables (6 db/km) remote control of the system is possible from a distance of 3.3 km without linear amplifiers. In addition, in comparison with a coaxial cable the fiber-optic cable has a low weight-per-unit length (less than 34 kg/km), it actually emits no signal, and the information passing along it is practically unaffected by any interference.

It is planned to use the new radio communications system to replace the AN/MRC-107 and -108 units in the inventory, which are considered outmoded. In the near future it is planned to produce almost 430 of them: 300 for the U.S. Air Force and the rest for export.

6904
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DEFENSE OF NATO ATLANTIC LINES OF COMMUNICATION

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 6, Jun 84 (signed to press 7 Jun 84) pp 59-64

[Article by Capt 3d Rank A. Biryusov; passages rendered in all capital letters printed in boldface in source]

[Text] Ruling circles of the United States and its allies in the aggressive NATO bloc set aside a prominent place in preparations for unleashing a new war in the Atlantic, which they regard as the main ocean springboard for military actions against the USSR and other countries of the socialist camp and the chief transport route for assuring their economic and military might.

As noted in the foreign press, transatlantic lines of communication [LOC] play an exceptionally important role in supplying the industry (including the military industry) of bloc countries with many kinds of strategic raw materials. The North Atlantic alone, included in the NATO zone, accounts for two-thirds of world shipping and a considerable volume of air movement. Each day there are approximately 3,350 vessels in the Atlantic Ocean basin and some 2,800 more are being loaded or unloaded in West European ports. More than 60 percent of the volume of world foreign trade cargoes carried over the sea lanes is by vessels passing over the Atlantic and beginning or ending their trips in its ports.

The experience of the two past world wars convincingly prove the Atlantic is a very important region of the World Ocean through which pass the capitalist world's chief LOC used for military purposes. For example, during World War II the escort of some 3,000 convoys (90,000 transports) was organized here. The importance of these communication routes was reaffirmed by events of the Anglo-Argentine conflict during which expeditionary forces of the British colonizers were moved, their power was built up and they were supplied over transatlantic LOC.

The NATO leadership assumes that in a future war the Atlantic will remain the chief ocean theater of war. In their opinion, the chief engagements by navies of opposing coalitions will unfold here, and the defense of its lanes (the "Atlantic bridge" according to western terminology), over which troops of the

strategic reserve, armament, food and other supplies will be moved from America to Europe in the threatened period and in different stages of military operations in the interests of the initial and subsequent operations by NATO armed forces in continental TVD's [theaters of military operations], will become the primary mission of the bloc's OVS [joint armed forces] in this region.

As emphasized in the foreign press, the NATO command proceeds from the following assumptions in examining the problem of protecting the "Atlantic bridge":

--In case of a war in Europe NATO's European countries will not be able to withstand the Warsaw Pact's joint armed forces without troops of the U.S. strategic reserve;

--The bloc's grouping of armed forces in the European theater of war will be able to offer resistance to the enemy without replenishment of reserves of combat equipment and MTO [logistical support] only during the first month of military actions;

--Without replenishment of stores of raw materials, the main sectors of industry of the bloc countries in Europe actually will cease to manufacture products 90 days after the beginning of a war;

--The outbreak of war in Europe simultaneously will cause the beginning of combat actions in the Atlantic, which will lead to the global employment of the navies of the United States and other member countries across a broad front and to the entire depth of the ocean theater of war;

--Operations in continental and maritime TVD's will bear a coordinated character and be distinguished by the comprehensive employment of all branches of bloc armed forces;

--The primary mission of fleets of the opposing side will be disruption of NATO's "Atlantic bridge."

In analyzing the experience of using ocean and sea LOC during World War II, American experts figured that during 1939-1945 the Allies lost 2,603 ships and vessels as well as 50,000 persons in the Atlantic. These losses will be immeasurably greater in a future war in connection with the predicted increase in the volume of movements. It is assumed that the greatest loss will come in the first 30 days of war (up to 50 percent of the losses of the bloc's entire merchant fleet). A fact which can serve as confirmation of this assumption is that during NATO's strategic command and staff exercise Wintex-83 one-third of the vessels and transports intended for moving reserve troops and cargoes was considered destroyed just 24 hours after the beginning of the "war." It was noted that an increase in air deliveries and advance stockpiling of heavy combat equipment in Europe will reduce the use of maritime transport for carrying cargoes only to a slight extent. Ninety-five percent of the volume of cargo movements will continue to be made by sea. A deciding role will be given the naval forces in preventing (or decreasing) enemy pressure on NATO's vitally important ocean and sea LOC.

According to views of western military specialists, submarines present the chief threat to shipping. Antisubmarine warfare is considered one of the most difficult missions due to the enormous spatial scope of the Atlantic theater of war. For this reason the imperialist states are giving considerable attention, within the overall system of preparations for war at sea, to the development of the forces, means and methods of this struggle.

Aviation can inflict a significant loss on NATO's merchant fleet on the sea LOC. With consideration of this factor, destruction of aircraft at airfields and in the air is one of the primary missions for units of the bloc's attack fleet in the Atlantic deployed on the most threatened axes and approaches to convoy routes.

The NATO OVS command believes that mine ordnance, emplaced above all in the vicinity of ports of embarkation and debarkation, in areas where convoys are formed and disbanded, and in straits and narrows, also presents a great threat to shipping. It can create considerable tension on the LOC and at times even fully paralyze movements.

Surface combatants are a traditional and fully effective means capable of disrupting sea LOC. Their role is constantly growing in connection with an increase on them in the number of ship-to-ship missiles, the destructive force of which is becoming ever greater thanks to an increase in the power of warheads, in kill accuracy and in flight range as well as an improvement in the capability of overcoming an antimissile defense.

Judging from foreign press materials, defense of the Atlantic LOC is the responsibility of the NATO OVS supreme commander in the Atlantic and is arranged on a zonal principle (according to the bloc's organizational structure and the distribution of duties). Commanders in the zones and regions assign the necessary forces for this purpose. The supreme commander of the NATO OVS in Europe organizes defense of LOC in European waters, and this is done in the zone of the English Channel by the commander of this zone.

According to the estimate of NATO specialists, the grouping of naval forces which is to accomplish the entire set of missions assigned to it, including defense of LOC in the Atlantic, the Mediterranean, and the North and Baltic seas, is detailed from navies of the United States and other bloc countries including France and Spain. Its size can be more than 60 nuclear submarines and some 140 diesel submarines, ten multirole and three antisubmarine carriers, almost 400 cruisers, destroyers, frigates and small ASW ships (approximately half of them URO [guided missile] combatants, see color insert and Fig. 1 [color insert and figure not reproduced]), some 270 minesweeping ships and more than 120 guided missile patrol boats. Naval aviation will have up to 1,000 carrier-based and land-based aircraft (including more than 200 land-based patrol aircraft and over 80 fighter-bombers), as well as some 500 deck-based and land-based antisubmarine helicopters. The American forces of this grouping can include more than 40 nuclear-powered submarines, seven multirole aircraft carriers, more than 100 cruisers, destroyers and frigates (of which 60 are URO combatants), approximately 500 carrier-based aircraft, more than 100 land-based patrol aircraft and 100 deck-based antisubmarine helicopters.

As the foreign press notes, the NATO command takes defense of the "Atlantic bridge" to mean the conduct of organizational measures, special operations of an offensive nature as well as defensive actions.

ORGANIZATIONAL MEASURES include the removal of the friendly merchant fleet from enemy ports, evacuation and dispersal of transport vessels, organization of the defense of ports, anchorages, and areas where convoys form and are disbanded, deployment of naval forces in areas of impending combat actions, and the imposition of naval control over shipping. The latter takes in matters involving the formation of a joint fleet of NATO transport vessels, assuring their security, organizing convoys and their passage to destinations, choosing the safest movement routes for convoys and lone vessels, providing necessary information about the existing situation in various parts of the World Ocean, and so on. Entities of the naval control service will be set up in all major ports of the "zones of responsibility" of bloc OVS commands in the Atlantic, in Europe and in the English Channel zones.

The foreign press emphasizes that activities of naval forces of the United States and its NATO allies will bear a clear-cut OFFENSIVE character from the very beginning of the war and defense of the "Atlantic bridge" is viewed in indivisible unity with winning superiority in key areas of the ocean and seas. By taking them the NATO leaders figure on precluding the possibility of the enemy's employment of forces capable of delivering strikes against convoys and creating a threat to the LOC.

Special antisubmarine operations for hunting and killing nuclear and diesel submarines also may be subordinated to this same goal. In addition, it is planned to conduct special operations to defend the LOC. Carrier and ship striking and hunter-killer groups and land-based patrol aircraft will be brought in for participation in them. As shown by the experience of NATO exercises, tactical aircraft and DRLO [early warning] (Fig. 2 [figure not reproduced]) and AWACS [airborne warning and control system] aircraft also will find wide use in such operations. The basic methods for defense of the LOC will be a "protected zone of sea LOC" and a "moving zone of supremacy." The former presumes the concentration in a specific operation zone of naval forces assigned for this which will conduct combat actions to destroy the enemy and crowd him from the zone both independently and in coordination with other branches of the armed forces. The latter is used in escorting especially important convoys. Carrier and ship striking and hunter-killer groups as well as nuclear submarines, land-based patrol aircraft and deck-based antisubmarine aircraft can be included in their escort forces, providing sea and air superiority in a limited, moving zone.

In the views of western specialists, DEFENSIVE ACTIONS presume the conduct of antimissile, antiaircraft, antimine and antilanding defense of naval bases (VMB's), ports, anchorages, and sectors of the coast and coastal zone where convoys are formed and disbanded, where troops and cargoes are unloaded over the beach, and so on. The protection of convoys, which previously was relegated to purely defensive measures, presently is being enriched with offensive tactics and is viewed as a special form of actions by naval forces, the chief

purpose of which is to ensure the safety of vessels. This is achieved by forcing the enemy to accept battle where it is disadvantageous to him both because of place and time.

It is emphasized in the foreign press that in the first days of a war protection of the LOC will be accomplished above all by creating a favorable operational regime for friendly shipping while winning superiority in those areas where the enemy is capable of acting most effectively on NATO's LOC. In addition, the bloc command plans to create a threat directly at enemy VMB's and on deployment routes for the purpose of preventing the reinforcement of enemy groupings deployed in the Atlantic while it is still peacetime. Foreign specialists state that such a threat can become fully realistic because of the deeply echeloned operational alinement of NATO's joint naval forces and their well-developed system of basing in the Atlantic. It is planned to employ attack carrier groups in the first echelon. They will use the forces of deck-based attack aircraft to deliver strikes against enemy VMB's and airfields and counter the deployment of his ships and aircraft in the areas where they have combat missions. Second echelon forces are to conduct the fight against ships which are both at sea while it is still peacetime and those which penetrated first echelon combat formations.

In the first days of a war the main forces of the attack fleet and NATO's joint naval forces will be diverted to accomplish missions of winning superiority in key areas of the Atlantic and European waters (based on exercise experience, the northern part of the East Atlantic and the Norwegian and North seas can be such areas). In this connection it is not mandatory to assign forces to immediate convoy security with the exception of specially important instances. The NATO OVS command explains this by its lack of a sufficient number of escort ships. The foreign press which covered the progress of Exercise Ocean Safari-83 expressed the opinion that NATO needs at least an additional 250 escort ships in the Atlantic zone in order to carry out missions of defending the LOC to the full extent and not divert ships and aircraft engaged in other no less important matters for their accomplishment.

In the opinion of American specialists, the NATO bloc must have a transport fleet of 4,000 vessels with a total displacement of 50 million tons in order to maintain the necessary level of military deliveries to Europe. They believe that the average monthly requirement for maritime transport resources will be 600 vessels (12 convoys), and 120-140 ships are necessary for their security. Meanwhile there are press reports according to which 270 escort ships per month will be required to escort convoys (with consideration of the nature of combat actions in the Atlantic and the sequence of the fleet's accomplishment of primary missions).

Western specialists state that the size of forces assigned from naval forces for the protection of transatlantic LOC is clearly insufficient. Therefore the NATO command is studying other ways to solve this problem. In its opinion, a rather promising direction is the outfitting of merchant vessels with containerized systems of antisubmarine and antiaircraft defense, which improves the effectiveness of convoy defense and frees a portion of the

combatants for accomplishing other missions. For example, the United States and Great Britain are developing the Arapaho containerized antisubmarine defense system. It can be installed on a container carrier within several tens of hours.

The foreign press notes that the use of fast single transports for movements is allowed under certain conditions. It is believed that with a considerable number of independently operating vessels on the ocean daily the enemy will be deprived of an opportunity to deliver concentrated strikes against them and will be forced to dissipate his forces for hunting and killing them, which will sharply decrease the stability of his naval forces.

A decision on the form in which shipping is organized in wartime (convoys or individual vessels) will depend in each specific instance on availability of forces and resources which can be assigned for protection of the LOC, the situation existing in the Atlantic, and the enemy's actual capabilities.

The merchant fleet of the United States and other NATO countries is given a significant role to play in imperialism's militaristic preparations inasmuch as their shipbuilding programs are under the control of military departments, and the possibility of use in a war is considered when new vessels are built. These vessels have increased speed, considerable endurance and a sufficient amount of load-handling equipment, and they can unload directly over the beach.

NATO leaders proceed from the assumption that the merchant fleet can perform its missions in a future war only if necessary capacities exist for the accelerated construction and repair of vessels to make up for presumed losses on sea LOC. Since the time of World War II the United States has gained extensive experience in the mass construction of modular vessels with a gross registered tonnage of from 6,500 to 10,500, which were built in record short times. For example, 10½ days were spent building the transport "Robert Peary" (7,200 gross registered tons) in 1942 (112 hours from laying-down to launching and six days for completion afloat and for becoming operational). Some of the vessels of wartime construction are still operating.

In the views of foreign specialists, the standardization, packing and storage of military cargoes gains special significance in NATO. In their opinion, packing on pallets and the use of standardized containers allow the attainment of that speed of transshipment work which will reorganize the entire logistical support system.

The U.S. Armed Forces and NATO OVS commands keep a large number of vessels in a high state of readiness in order to carry out measures for organizing sea movements which presently take considerable time. In case of a war these vessels are to perform the task of moving troops and cargoes to Europe in short time periods.

Much emphasis also is placed on improving the infrastructure of ocean and sea TVD's. According to foreign press data, the Atlantic's European coast has

more than 300 ports and points where transports displacing up to 40,000 tons can unload. There has been a recent expansion in the network of ports at which vessels with large displacement can be processed, port equipment is being improved, channels are being deepened, new berthages are being built, models of mobile equipment are being developed for unloading vessels over the beach (floating landing stages, cranes, oil storage tanks), the navigation support system is being improved and navigational ISZ's [artificial earth satellites] are becoming widespread.

In the opinion of NATO leaders, realization of the measures enumerated will permit increasing the mobilization capabilities of bloc countries' merchant fleets in short time periods and will assure their effective use during movements and the supply of groupings of armed forces conducting combat actions in remote TVD's.

Thus, taking into account the fact that the importance of ocean and sea (and above all transatlantic) LOC is growing, the U.S. Armed Forces and bloc OVS command elements regard protection of the sea lanes as one of the chief components of operations by joint naval forces aimed at preserving their military-economic potential--conditions without which, in their opinion, it is impossible to count on victory in a future war. It is to this end that the leadership has formed a very large grouping of naval forces in the Atlantic which presents a threat to freedom of using the World Ocean and a threat to the peace and security of peoples of coastal states.

6904
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U.S. NAVY COMPUTERS

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 6, Jun 84 (signed to press 7 Jun 84) pp 67-71

[Article by Capt 1st Rank (Res) M. Tsiporukha: "EVM (Electronic Computers) in the American Navy"]

[Text] Over the last 10-15 years electronic computers (EVM) have become a mandatory component of tactical data control systems (BIUS: NTDS [navy tactical data systems]), weapon and equipment control systems, and shipboard sonar (GAS) and radar in the U.S. Navy. This stems from the fact that a need arose in the 1970's to develop sophisticated computer systems for processing the data of target detection equipment and for subsequent analysis of the combat situation in connection with an increase in target speed and maneuverability, an increase in their numbers and, most important, an increase in use of electronic warfare [EW] resources.

Recently the United States has begun trying to increase the effective range and resolution, to decrease reaction time, to improve effectiveness under jamming conditions and so on during the development of new sonar and radar models.

American naval specialists believe that the precise operation of a radar or sonar is inconceivable in a complicated combat situation when there are numerous targets of various types and under the effect of various kinds of deliberate and natural interference without the automation of all control processes, especially if one considers that shipboard stations now are not autonomous information sources, but a component part of weapon control systems. The inclusion of EVM's in the make-up of radars and sonars permitted an additional increase in their effectiveness through the correlation processing of signals coming from them.

Shipboard EVM's in the 1960's were distinguished by diverse types and narrow specialization, which restricted their application outside of the specific system for which they were developed. In the late 1960's and early 1970's the U.S. Navy command undertook vigorous steps for their standardization and unification. In particular, multipurpose EVM's in a modular design began to be developed in 1968 for installation aboard surface combatants, submarines and flying craft and at shore installations.

Specifications of Computers Used in the U.S. Navy

Basic Characteristics	Type of Computer				
	AN/UYK-7	AN/UYK-14	AN/UYK-15	AN/UYK-20	AN/UYK-30
Year operational	1970	1976	1976	1973	1978
Field of use	Ship sonar, radar, NTDS	Ship& airborne ASC	Navy, Air Force & Army ASC	Ship, airborne & ground EW	Navy airborne systems
Speed, K operations/sec	300 — 600	670	1350	1000	340 — 600
Main memory capacity, K words	256	128	64	64	64
Mean time between failures, hrs	2000	2200	6000	2000	1300
Element base	SIS	BIS, SIS	SIS	SIS	SIS, BIS
Size, mm: length	•	193	•	510	127
width		257		410	50
height		356		610	50
Weight, kg	225	13 — 28	60	50 — 100	•

Integrated circuits began to be used as the basic elements of EVM's in the late 1960's, which improved the equipment's reliability, its stability toward shock and vibrations, and low sensitivity to fluctuations in supply voltage and toward ambient conditions. Subsequently medium-scale integrated circuits (SIS) and largescale integrated circuits (BIS) appeared. The density of transistors assembled on a crystal reaches 5,000-10,000 in the BIS.

The Sperry Univac AN/UYK-20 sixteen-bit minicomputer is regarded as one of the most widespread in the American Navy. It is standard and is used in shipboard and shore electronic systems and sets including the AN/SPS-48 and AN/SPS-58 radars, the Mk 48, 68 and 86 shipboard fire control systems, the LAMPS [Light Airborne Multipurpose System] equipment, the SOSUS fixed long-range sonar surveillance system and others. The number of such EVM's in the Navy reached 1,000 in early 1978.

The AN/UYK-7 EVM of the very same firm is also widespread aboard ships. The Navy was supplied with more than 500 machines of this type by the late 1970's. The AN/UYK-20 and -7 standard third-generation EVM's are used as part of the NTDS, the Aegis multifunctional system, the AN/BQQ-5 sonar system and others. It is planned to use them until the mid-1990's.

In 1976 the AN/UYK-14, which if necessary can be replaced by the AN/UYK-20, was made operational as a standard EVM for naval aircraft and helicopters. It is also intended for inclusion in data processing systems aboard surface combatants and submarines in those instances where use of the AN/UYK-20 will be inadvisable.

That same year the AN/UYK-15 (modular, universal, medium capacity) was made operational in the Navy as a promising EVM. It operates in real time in data processing systems, it is made on the basis of SIS and BIS, it has sufficiently high speed and it has a flexible structure permitting ancillary devices to be connected to it for expanding its functions.

The specifications of EVM's which are most widespread in the U.S. Navy are given in the table.

Fourth-generation standard shipboard EVM's have been under development since the late 1970's and early 1980's. For example, Sperry Univac developed the AN/UYK-43 and AN/UYK-44 minicomputers in which the BIS's are the main element base. Both of them were tested in 1983.

The AN/UYK-43 (with a speed of 2.3 million operations per second) is to replace the AN/UYK-7 in the NTDS of surface combatants of the main types and of submarines. It is 48x51x61 cm in size with power unit and ZU [memory unit], and it can operate normally with an ambient temperature of from -54° to +65°C. It is planned to manufacture a total of more than 500 sets and to begin delivering them as early as this year.

The AN/UYK-43 and AN/UYK-44 EVM's were developed with a modular design. For example, the ZU is made from a set of modules with functional circuits assembled on ceramic cards with a high packing density (twice that of printed-circuit cards).

The AN/UYK-44 EVM includes 35 types of modules, it has a device for connecting up to four million words of external memory (two modules for each 0.5 million words) and it can have up to 64 input-output channels. All modules operate in a temperature range of from -54° to +100°C.

The AN/UYK-30 microcomputer, which consists fully of modules, became operational in 1978. The foreign press reports that high capacity, high reliability, small size and relatively low cost predetermine its further use in many naval electronic systems presently being developed.

Special attention is given to the compatibility of all EVM's being developed and planned for use aboard ships with those already in operation. No less significance is attached to the standardization of software with consideration for the sharp increase in its development cost, which comprises four-fifths of the cost of the military computer systems themselves.

The U.S. Navy leadership is orienting firms toward using an element base in the new EVM's which has a high degree of integration and toward the development of multiprocessor systems and methods for parallel data processing with the use of specialized microprocessors (MP's) based on BIS's within the EVM structures. The modern standard MP is the central part of a computer system consisting of one or more BIS and including an operating arithmetic-logic device and control device which execute the command (microcommand) sequences specified by the problem-solving program. The microprocessor is the basic

part of a microcomputer. In addition to the microprocessor the microcomputer includes a ZU, input-output device, and buffer circuit for interfacing with external devices, as well as a control panel, power sources, and set of software.

The third generation of MP's included in contemporary shipboard EVM's has been manufactured since the mid-1970's with a technology permitting more than 5,000 transistors to be included on a crystal. Such microprocessors function with significant deviations of supply voltage from nominal. Microprocessor modules already are being manufactured at the present time, which reduced the cost and increased the capacity of computer systems. A reduction in weight and size characteristics facilitates the broad introduction of computer equipment to shipboard control systems.

Special attention is being given in the Navy to the development and effective use of electronic digital devices for processing sonar data. Sonars with electronic digital computer devices for controlling the GAS themselves and for picking out useful sonar signals from a background of interference were being developed in the United States as early as the mid-1960's. Their capacity averaged 100,000-500,000 operations per second. It is necessary to have a capacity of at least 350,000-400,000 operations per second for processing sonar data coming only along one space-frequency channel.

The digital computer devices of that period could support GAS operation only with a small number of space-frequency channels. Therefore to increase the likelihood of detection and precision in classifying quiet targets (which in the opinion of foreign specialists is possible only by processing a large volume of sonar data in real time), it was necessary to include a number of ancillary processors in the GAS (in addition to the main processor) which would be controlled centrally while operating in parallel, but they required sophisticated software.

Single-processor signal processing devices with a capacity of up to 7-8 million operations per second were developed in the mid-1970's after industrial production of the BIS was mastered, and computer devices of a fundamentally new structure were developed for the GAS. Digital computer systems were put in production which represented a set of separate microprocessors joined, together with central EVM's, into a unified system which was called a semimultiprocessor system. Such a system was used in the AN/BQR-24 sonar aboard "Los Angeles" Class nuclear submarines.

Consolidation of the MP's into matrices is the following phase of development of digital computer equipment for the GAS. In the opinion of American specialists, the use of such structures for building computer equipment will increase the capacity of sonar data processing systems by more than 30 times, while the comprehensive flexible control will permit a significant increase in the effectiveness of GAS operation through the organization of parallel signal processing (in accordance with each subsystem's tasks) and program optimization. In addition, multichannel self-adapting (adaptive) space-frequency sonar data processing by digital methods, preliminary signal processing, the

broadband and narrowband processing of passive and active sonar signals as well as echoes, the formation of complex emitted signals, effective target detection and classification, as well as control of the entire system and monitoring of its functioning are possible.

The foreign press reports that such a structure of digital sonar data processing can be adapted for the detection and classification of quiet targets with the use of data on the coordinates of powerful noise sources in the GAS operating zone (such sources may be large surface vessels, ship forces, offshore drilling rigs and so on). It is assumed that signal processing for superlong-range detection and precise classification of quiet targets will be stably assured as a result of the further development of the digital computer equipment included in the GAS.

Microprocessors also are widely used in contemporary side-looking sonars. It is only with their help that an undistorted image of the seabed can be obtained in real time. MP and ZU with considerable capacity permit quantization of signals being received for subsequent digital processing, the performance of computational operations, and the forming of signals making it possible to print out ancillary alphanumeric data on the course, the platform's coordinates, recording time and so on synchronously with the image recording (on the very same tape).

The use of digital computer equipment in the 1970's increased the effectiveness of shipboard radars. Specialized processors with rigidly fixed programs for executing certain invariable functions such as signal storage were used for processing radiotechnical signals.

Then processors were developed which processed signals for solving target selection (detection) tasks and for their automatic detection and resolution when close together. The processor control programs became more and more flexible and developed, which permitted changing them rapidly for accomplishing the broadest range of tasks.

The digital processing equipment considerably improved the detection of signals against the background of interference caused by reflection from the sea surface and weather formations. There was also an improvement in the quality and effectiveness of storing signals of the same frequency and amplitude, and various types of filtration, correlation processing and spectral analysis of signals. Digital computer processors permitted moving target selection (SDTs), which is the basic means for suppressing signals reflected from local features and the underlying surface.

At the present time radars in the naval inventory are being modernized by including electronic means of digital signal processing in their make-up. For example, the standard AN/SPS-52 shipboard three-dimensional radar was improved by combining it with the AN/SYS-1 digital device for processing radar signals. It processes data coming from a number of radar inputs and allows using the capabilities of various radars located aboard one ship. Signals concerning detected targets come from each radar to the AN/SYS-1, where they undergo

correlation processing. This device sets a detection threshold and search area for each set and it controls the automatic target tracking process. Comprehensive tests of the AN/SYS-1 in combination with a number of standard shipboard radars were conducted back in 1978. Therefore radars which are to be interfaced with it began to be developed in the 1980's.

At the present time digital computer equipment of radars is being used as part of distributed radar signal processing systems. Several computer processors are consolidated into a unified system, thanks to which complicated tasks can be broken into parts and their solution occurs simultaneously. This allows overcoming the restrictions connected with insufficient EVM capacity. Improvements in microprocessors and microcomputers accomplished in the 1970's gave considerable impetus to the development of distribution systems in which a general memory and input-output device with common access to a unified operating system for control of all processors usually are used. That principle of distributed processing is being used in the U.S. Navy for consolidating all shipboard electronics into a unified system. In this case the AN/UYK-20 minicomputer is the standard computer device.

American military specialists presently regard specialized microprocessors as an essential element of radars, and so the development of software has become an important part of the process of developing the very equipment of these sets.

It should also be noted that microprocessors, microcomputers and minicomputers were being used aboard U.S. Navy ships as part of the equipment of automated control systems (ASU) for the main propulsion plants and other equipment as early as the late 1960's and first half of the 1970's. These ASU's usually have a pyramidal structure with a hierarchical principle of organization. Its lower level consists of remote control systems, autonomous regulators, microprocessors and so on; the middle level consists of microcomputers, minicomputers with centralized control and so on, by which control is programmed and there is an optimization of power plant work modes, diagnostic and strength monitoring, effective control of individual mechanisms and devices, and control of the power plant as a whole. At the highest level of the hierarchy is an EVM which performs the functions of setting power plant regimes, periodicity of centralized monitor operation, and other functions.

We will note in conclusion that the U.S. Navy command is widely introducing electronic computers aboard ships for the purpose of improving the effectiveness of employing shipboard armament and equipment, and consequently for strengthening the Navy's might.

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AIRLAND BATTLE CONCEPT ANALYZED

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 7, Jul 84 (signed to press 10 Jul 84) pp 29-35

[Article by Col V. Volobuyev, candidate of military sciences, docent; and Lt Col N. Nikolayev, based on views of American military specialists; passages rendered in all capital letters printed in boldface in source]

[Text] In order to achieve military superiority over the USSR and other countries of the socialist community, the U.S. military leaders are developing new forms and methods for conducting combat actions along with the outfitting of ground forces with new models of weapons and combat equipment and an improvement in the organizational structure of their formations [ob"yedineniye] and units [soyedineniye and chast'], in order to make fullest use of the growing capabilities of combined-arms formations.

American military specialists believe that a potential enemy can have numerical superiority in forces and resources in the initial period of combat actions in the European Theater of War. This will permit him to conduct actions while simultaneously preserving a significant portion of his forces and resources in the second echelons (reserves), which can be subsequently committed for final defeat of the opposing side. For this reason the command element defines the capability of building up first echelon efforts and employing forces and resources en masse as one of the basic, fundamental provisions of the probable enemy's military art. Based on this the conclusion is drawn that the defeat of first echelons still does not mean total defeat of the enemy, who will be capable of conducting active combat actions using the preserved portion of forces and resources. The American command sees a solution to the problem of defeating superior enemy forces in the development of that approach to organizing and conducting combat actions which would provide a decisive and earlier simultaneous defeat of all echelons of the opposing troop grouping using the forces and resources of combined-arms formations of the ground troops and air force tactical aviation on the basis of fullest use of the increasing combat capabilities of nuclear and conventional weapon systems, and means of control, reconnaissance and target designation.

According to foreign military press materials, in elaborating such an approach American specialists are basing themselves on a comprehensive study, analysis and assessment of the probable enemy's tactics and operational art, and the

operational-tactical norms and combat capabilities of his units. At the same time there also was a revision in the views of the ground troops' command as to the nature of probable combat actions and the employment of forces and resources with consideration of the reorganization being carried out in the ground troops under the Army-90 program. As a result of military-scientific studies and experimental tests of the "active defense" concept, which did not decide the problem of defeating deeply echeloned enemy groupings, there appeared new concepts about an "integrated battlefield," "extended battlefield," "deep attack/battle" and others.

These concepts and views of the U.S. Army command also were reflected in the so-called AIRLAND BATTLE CONCEPT, which lately has been discussed widely in pages of the American military press as a basic ground forces' concept which determines the forms and methods of conducting combat actions for the period up to the year 2000. Foreign press publications emphasize that it reflects qualitatively new views of the American command on the make-up and nature of future combat actions with consideration for the technical refitting of the U.S. ground troops during the 1980's, which will help solve the problem of defeating deeply echeloned enemy formations.

According to views of American military specialists, the essence of the "Airland Battle" concept consists of achieving the enemy's defeat to the entire depth of his troops' operational alinement by inflicting maximum damage on him by nuclear, chemical and precision conventional weapons. The employment of weapons will be strictly coordinated and unified by a common concept with the combat actions of ground and tactical air units and, on maritime axes, with combat actions of naval and marine forces. It is noted that the concept envisages the close interworking and interrelationship of ground, air and naval (on maritime axes) components of the troop (force) grouping during accomplishment of missions at two levels--operational and tactical. It is believed that such airland combat actions will be most typical of the initial period of war in a TVD [theater of military operations] where deeply echeloned troop groupings already have been deployed.

As reported in the foreign military press, the make-up of the "Airland Battle" concept is characterized by fundamental and interrelated concepts about the "integrated battlefield" and "extended battlefield."

In contrast to previously accepted views, the first concept envisages continuous integrated planning and comprehensive employment of nuclear, chemical and conventional weapons and REB [electronic warfare: EW] assets of the grouping's air and ground components. As noted in foreign publications, realization of this provision pursues the goal of the prompt and effective destruction of important enemy targets in accordance with the concept for conducting combat actions, as well as necessary measures for protection of friendly troops. It is believed that basic provisions of the "integrated battlefield" concept contribute to the elaboration of a more specific fire and maneuver plan; rational distribution of efforts by ground and air forces and resources for reconnoitering and hitting the enemy's first and second echelons and his troops ahead of the front, on the flanks and in rear areas; and exercise of the comprehensive preemptive use of nuclear, chemical and precision conventional weapons and EW assets.

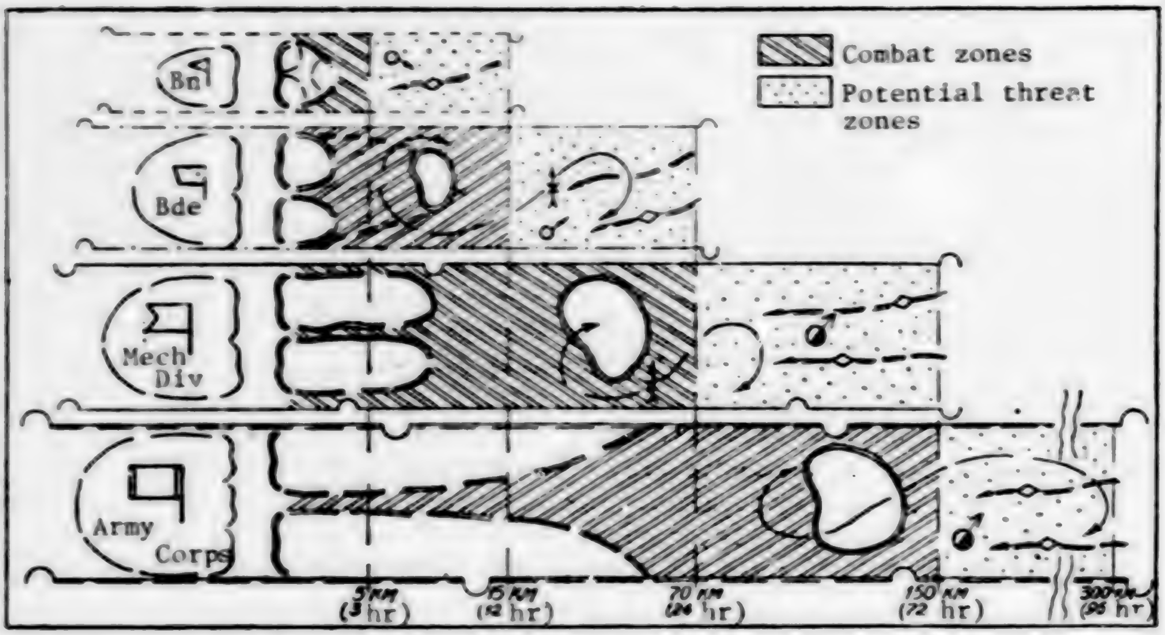
The second concept assumes an increase in the depth to which the enemy is affected by forces and assets of the ground and tactical air formations and units based on their capabilities for simultaneous destruction of opposing first-echelon troops and carrying out the deep destruction and delay of second echelon (reserve) troops. American military specialists note that successful accomplishment of these missions will be assured by precise delineation of areas of responsiblity of command echelons, by advance planning for preempting the enemy in actions, and by an increase in the proportion of pressure on the enemy exerted by the senior commander's assets for assuring performance of missions by subordinates through damage inflicted on enemy second echelons (reserves) and their delay. It is also planned to have areas of responsibility of lower command echelons fully covered by the area of responsiblity of the highest echelon; in the opinion of the American ground forces' command, this will facilitate the more precise and coordinated employment of forces and resources of ground formations and supporting tactical aviation in exerting simultaneous comprehensive pressure on the first and second echelons (reserves) of enemy troop groupings.

For example, in assigning missions to subordinates and allocating necessary reinforcing forces and resources, the senior commander will simultaneously plan the conduct of combat actions in his own deeper area of responsiblity. During combat he must try to make use of available weapons so as to inflict maximum damage on enemy troops located outside areas of responsibility of subordinate commanders, thanks to which they gain time needed for executing missions of routing the enemy immediately opposing them. It is assumed that advance planning for preempting the enemy in actions will be accomplished on the basis of timely information given by the superior commander to lower command echelons about losses and the probable nature of subsequent actions by the enemy's second echelons (reserves). It is believed that this procedure will permit lower commanders to plan in advance and carry out preemptive strikes, to seize the initiative and achieve the enemy's swift defeat in detail.

The foreign press notes that a division of areas of responsibility of troop echelons into two interrelated zones--a combat zone and potential threat zone (see diagram on next page)--can help improve the quality of planning combat actions and coordinating fire and maneuver.

The COMBAT ZONE is the belt of terrain from the line of contact in the direction of the enemy within which the enemy objectives (targets) are subject to detection and destruction (neutralization) by forces and assets at the disposal of the commander of the given troop echelon. The depth of the combat zone is determined by the range of weapons and the time needed by unit and formation commanders to destroy enemy first echelon troops and prepare for subsequent actions to defeat his second echelons. Under European Theater of War conditions the depth of combat zones can be up to 15 km (12 hours) for brigade, 70 (24) for division, 150 (72) for corps and 300 (96) for formations above corps.

The POTENTIAL THREAT ZONE is beyond the combat zone. In it are the enemy troops (subsequent echelons, reserves) whose approach and commitment may substantially affect the course of combat actions. Its depth can be up to 70 km for the brigade, up to 150 for division, up to 300 for corps and up to 1000 for higher formations.



Distribution of Zones of Responsibility of U.S. Army Subunits and Units

The advance planning for destruction of succeeding echelons (reserves) will be accomplished by the brigade 24 hours before arriving at the opposing sides' line of contact, 72 hours before by the division, 96 hours before by the corps and more than 96 hours before by formations higher than corps.

The foreign military press reports that the size of these zones may change depending on the nature and intensity of combat actions, the terrain, presence of forces and resources, enemy capabilities and so on. It is emphasized that data on the enemy located in the potential threat zone will become the basis for planning the defeat of his succeeding echelons by the time they enter the combat zone of a given echelon. Collection of the data will be done by forces and resources of the ground troops and tactical aviation and their processing will be done by the combined-arms staffs. It is assumed that the higher commander must inform his subordinates promptly about the enemy located in their potential threat zones.

The so-called "DEEP ATTACK" of the opposing troop grouping is the basic component of the "airland battle" concept. American military specialists note that its chief purpose is to create the most favorable conditions for completing the destruction of the enemy's first echelon and for preparing for subsequent actions against his second echelons for the units engaged in combat. These conditions will be determined by the amount of damage inflicted on the second echelons by forces and resources of the higher troop echelon and by the time they are delayed.

Accomplishment of the "deep attack," which is based on the timely provision of intelligence to interested command echelons, assumes the conduct of coordinated actions by tactical aviation and by the forces and resources of ground formations and units to destroy, delay and disorganize the enemy second

echelon (reserve) or important individual enemy targets (means of nuclear attack, control points, communications centers, operational rear facilities, crossings, bridges and so on). The envisaged result is an abrupt weakening of the opposing grouping, disruption of measures to concentrate its forces and resources, achievement of operational or tactical advantage and, in the final account, assurance of the enemy's defeat in detail. It is reported that the primary means for delivering deep fire (nuclear) attacks in the interests of army corps will be aircraft of tactical aviation and reconnaissance-attack systems; in the interests of divisions it will be aircraft of tactical aviation, operational-tactical missiles, field artillery assets and army aviation helicopters; and in the interests of brigades it will be chiefly field artillery and combat helicopters.

According to American military press data, the accomplishment of "deep attack" envisages the isolation of the combat area, conduct of active electronic countermeasures and deception of the enemy regarding true intentions of the friendly command. It is planned to isolate the combat area by the following methods: destruction and delay of enemy second echelons (reserves) by weapons (nuclear weapons) of combined-arms formations and tactical aviation, raids by subunits and units of the ground troops and army aviation, and actions by special forces.

Active electronic countermeasures provide for precise coordination of EW measures and attacks by troops, weapons (nuclear weapons) and army aviation with raiding operations, while deception of the enemy envisages the conduct of deceptive, demonstration and dummy actions by friendly troops and misinformation.

According to American press reports, U.S. Army specialists identify four basic versions of the "deep attack" suitable for the offensive and defense.

The first pursues the goal of inflicting damage on enemy second echelon troops, by weapons above all, disorganizing them and delaying them for the time needed to defeat the first echelon.

The second version is used for destruction and delay, by fire assaults, of that portion of the second echelons which under existing conditions can exert the most substantial opposition to troops completing a maneuver in the process of defeating the enemy first echelon.

The third version envisages destruction of second echelons by weapons and troop attacks during the period of combat actions conducted against first echelons. It is believed that realization of actions under this most complicated version will require the use of a significant amount of forces and weapons as well as of combat subunits (units) and precise coordination of their actions with the employment of tactical army aviation and EW assets.

The fourth version can be used for destruction or disruption of actions of individual deeply situated enemy targets capable, in the specific situation, of affecting the course and outcome of the sides' opposition. American

military specialists assume that a well organized "deep attack" will contribute to a significant weakening of enemy capabilities to build up efforts, which in turn will assure the creation of favorable conditions for his decisive defeat.

A substantial role in the concept in question is set aside for matters of COMMAND AND CONTROL in an operation or battle, the most important components of which are decisionmaking, issuance of instructions, planning of the enemy's defeat, organization of coordination and exercise of supervision over the accomplishment of combat missions.

It is deemed advisable for the primary efforts of troops and weapons to be distributed rationally in decisionmaking and planning in the interests of destroying (damaging) the most important targets of enemy first echelons and especially second echelons (reserves). It is recommended that a combination of the enemy's destruction by fire and the maneuver of friendly troops for prompt exploitation of the results of destruction be precisely coordinated by time and place. It is also believed possible to give priority to the enemy's destruction by fire at the tactical level and to the maneuver of friendly units in directions unexpected by the enemy when accomplishing missions of operational importance.

In organizing coordination it is recommended that a central role be given to coordination of actions of the grouping's air and ground components by objective, place and time. Their actions are tied in with the use of weapons, tactical and army aviation, and EW assets. The U.S. Army command emphasizes that the use just of modern weapons possessing high accuracy of destruction will not permit winning superiority over the enemy. Only close coordination of units of all combat arms equipped with various weapon systems can lead to accomplishment of assigned missions.

Constant supervision over the course of combat is viewed as a measure by which the commander will exert influence on the development of combat in the interests of mission accomplishment and will force the enemy to act so that the deciding engagement occurs at that place and at that time chosen by the commander himself. At the same time, the commander has no opportunity to monitor every decision by subordinates under conditions of dynamic combat actions characterized by frequent and abrupt changes in the situation. Therefore it is deemed advisable to grant subordinates the right of displaying initiative and if necessary taking a calculated (substantiated) risk within the framework of accomplishment of the overall combat mission.

Immediate organization of air-ground combat actions and responsibility for their conduct is given to combined-arms commanders. It is recommended that they be guided strictly by four fundamental rules. Their essence lies in a display of initiative and in the depth, swiftness and coordination of actions.

INITIATIVE means preempting the enemy in making and implementing decisions and imposing one's will on him while preserving freedom of action for one's own troops. The American press emphasizes that troops, especially at the middle

and lower levels, must be ready to conduct independent combat actions resolutely in isolation from the main body under conditions of the enemy's active electronic countermeasures and a possible disruption of communications with higher headquarters.

DEPTH presumes the use of the entire expanse of ground and air spheres for delivering strikes against the enemy and preventing a unification of efforts by his second echelons (reserves) with first echelon troops fighting on the most important axes.

Judging from foreign press data, SWIFTNESS OF ACTIONS must provide for the commanders' anticipation of the course of development of events, efficiency and flexibility of their thinking, their adoption of nonstereotyped decisions and countermeasures, and timely concentration of the attack and firepower of friendly troops on axes dangerous to the enemy. The American command believes that in order to be superior to the enemy in swiftness one must have good reconnaissance and have air and ground units and subunits capable of quickly affecting a change in the situation in one's own favor in critical combat situations.

COORDINATION OF ACTIONS signifies the purposeful use of all weapons and troops in conformity with the integrated concept of airland combat actions. In the opinion of military specialists, by using this rule as guidance one can integrate the efforts of troops and weapons (nuclear weapons) to achieve surprise, maximum psychological effect and defeat of the enemy. It is believed that during operations army corps commanders will exercise coordination of combat actions of the divisions included in their make-up and will direct the actions of forces and assets subordinate to corps for the "deep attack" of second echelon units of the operational grouping of enemy troops. It is planned to employ aircraft of tactical aviation, reconnaissance-attack systems, Lance operational-tactical missiles and EW assets for this purpose. It is recommended that their use begin from a line 150 km away from the line of contact (i.e., from the far boundary of the corps combat zone), and that nuclear weapons be employed from a depth of 120 km. Forty-eight hours is considered an advisable time for delaying the enemy by corps assets until he enters the divisions' zone.

While directing the course of combat against an enemy in immediate contact, the division commanders simultaneously organize and accomplish, with their own forces and assets, the destruction, disorganization and delay of units and subunits of the second echelon (reserves) of enemy first echelon units. The aircraft of tactical aviation, army aviation helicopters, multiple launch rocket systems and tube artillery can be employed for accomplishing the above missions to a depth of 70-15 km in the divisions' combat zone. It is believed that the time for delaying the second echelons of enemy units until entering the brigades' combat zone must be 12 hours.

In addition to organizing coordination among battalion tactical groups and directing them during combat, brigade commanders will organize and deliver attacks against second echelon subunits of enemy first echelon units. It is

planned to complete the defeat of first echelon units in the brigade combat zones before the arrival of second echelons by a close combination of fire, maneuver and attack power of combined-arms units and strikes by combat helicopters and tactical aviation aircraft.

As the American military press reports, under conditions of the nodal character of airland combat actions, without clear-cut lines of contact of opposing sides and flanks, and in the presence of a constant threat to objects located in rear areas, there is a sharp increase in the role of combined-arms combat formations--battalion tactical groups formed on the basis of tank and mechanized battalions and supported by combat and logistical support subunits (artillery, air defense, army aviation, combat engineer and other subunits). In the opinion of the command element. establishment of such maneuverable formations for a period of combat will assure flexibility of their use on the battlefield in conformity with tactical expedience in the situation at hand.

In contrast to previous views, the combat actions of battalion tactical groups under conditions of airland combat may be characterized by the use of a lesser number of weapons assigned to them for fire support. Brigade and division commanders will resort to such weapons for the destruction (damage) and delay of enemy second echelons. In this regard American specialists are studying the question of wider use of mortars for accomplishing fire support missions and increasing battalion capabilities in the remote mining of terrain and crossing enemy minefields.

As the foreign press reports, complete elaboration and implementation in troop units of the "airland battle" concept is planned by the time new weapons are made operational and units complete the conversion to tables of organization and equipment under the Army-90 program. But American military specialists are speaking out in favor of having its basic provisions find practical application even now during combat and operational training of troops and staffs. It is believed that this will permit accelerating the process of concept implementation and improve the capabilities of combined-arms formations to conduct combat actions under the conditions of different theaters of war.

In working out and clarifying basic provisions of the "airland battle" concept, the American command began elaborating a follow-on aggressive concept--"Airland Battle 2000"--with consideration for the development of future weapons and further improvement in the structure of U.S. Army formations. In the specialists' assessment, the concept will bear the nature of an evolutionary development of the basic provisions of the concept we have examined and it is to be aimed at giving the combat actions of ground troops an active (offensive) nature at a higher operational or operational-strategic level.

6904
CSO: 1801/18

TANK POWER PLANTS

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 7, Jul 84 (signed to press 10 Jul 84) pp 35-40

[Article by Lt Col V. Gekov]

[Text] While directing primary efforts in their militaristic preparations toward a further increase in the tactical capabilities of tanks, foreign specialists are placing great emphasis on their mobility, which primarily is determined by power plant characteristics. They believe that in addition to providing high specific capacity, lightweight design and low operating cost, the modern tank engine must possess such qualities as high overall capacity and compactness, high fuel economy, and consequently a sufficient range. The power plant must have high reliability while operating under the widest ambient temperature conditions and with the tank crossing water obstacles over the bottom or afloat. Multifuel capability, easy start, the capability of taking a full load immediately after beginning operation, low noise level, prolonged service life, convenience of servicing and high maintainability is a far from complete list of technical requirements placed on the tank engine today in the course of its development.

Heavy-duty, high-speed diesel engines most fully meet such requirements. Modern tank diesels have relatively high fuel economy, including at partial load settings (the fuel consumption is approximately 40 percent less than for gasoline engines). In addition to this, their operation is characterized by a relatively low temperature level at the exhaust (100-200°C lower than for carburetor engines), which creates more favorable conditions for using the exhaust gases for turbo-supercharging.

Four-stroke diesel engines primarily are used in foreign tanks, although two-stroke diesels have been installed in some British, Japanese and Swedish models. The cooling systems are air (chiefly in American and Japanese tanks) and liquid (in tanks of European countries). West German specialists in particular believe that a liquid cooling system with thermostatic control of fan rpm is the most economical. For example, the power required for driving the fan in the Leopard-2 tank power plant is only 12 percent of the engine's nominal power in place of 18-20 percent in previous models.

All modern tank engines are supplied with compressors creating a pressure of 1.5 kg/cm^2 or more of the air forced into the diesel. The forced air is cooled in the latest diesel models, which improves the coefficient of admission of the cylinders in addition to helping boost the engine.

As a rule, modern diesel engines are made in a double-row V design configuration with up to 12 cylinders. It is believed that this configuration most fully provides for engine compactness and rigidity of its block-crankcase. The requisite ratio between engine height and width is achieved by choice of the angle of flare of cylinder blocks within certain limits. Basic characteristics of tank diesel engines are given in the table.

Basic Characteristics of Tank Diesel Engines

Engine Make (country-developer, installed in which tanks)	Maximum hp	Crankshaft rpm at maximum power	Nr of cylinders	Compression ratio	Specific fuel consumption, g/hp·hr	Overall volume, m^3	Weight of dry engine, kg
MB 838 CaM-500 (FRG, Leopard-1)	830	2300	10	19.5	159	1.59	1730
MB 873 Ka-501 (FRG, Leopard-2)	1500	2600	12	18	160	3.8	2590
AVDS-1790-2C (USA, M60A1, M60A3)	750	2400	12	16	176	3.8	2223
AVCR-1360-2 (USA, test XM1)	1500	2600	12	19.5—11	173	3.42	2030
12V-1200 Condor (UK, Challenger)	1200	2300	12	13	154	2.2	2041
HS-110 (France, AMX-30, AMX-30B2)	720	2400	12	21	175	1.63	1726
10ZF-21WT (Japan, 74)	750	2200	10	18.7	187	3.19	1200

Judging from foreign press reports, West German engine models presently are distinguished by the highest operating characteristics. The firm of Motoren und Turbinen Union is the primary manufacturer and supplier of diesels for Bundeswehr armored equipment. It developed three type-size series of high-speed diesel engines: MB 830, MB 870 and MB 880 (with output ranging from 500 to 1,800 hp).

One of the last models, the MB 873 Ka-501, is installed in the modern West German Leopard-2 main battle tank. A large amount of experimental tests preceded development of a series model. For example, development of a new engine, the MB 873 Ka-500, began in 1965 on the basis of the MB 837 family of tank engines. This version had the very same cylinder size (a diameter of 165 mm) as the base engine, but it was distinguished by a piston stroke 20 mm shorter (155 mm), lesser height, and maximum crankshaft rpm increased by 400 rpm. It was used in Leopard-2 tank prototypes.

Work to develop a new engine with a cylinder 170 mm in diameter and stroke of 175 mm began in the 1970's simultaneously with completion of the MB 873 Ka-500. This engine was designated the MB 873 Ka-501 and became the first series engine of a new type-size series. This is a V-12 four-stroke diesel adapted for operating on various grades of fuel including aviation kerosene and gasoline, for which its fuel equipment was fitted with appropriate devices. It is classified as a prechamber diesel with turbo-supercharging. The compression ratio was increased to 18 to improve the ignitability of light fuels.

Two turbocompressors and two coolers for the forced air, included in the overall cooling system, are mounted on the engine (Fig. 1 [figure not reproduced]). The arrangement of turbocompressors on both sides of the engine permits a rather simple discharge of exhaust gases through two manifolds passing above the transmission and leading to the rear of the tank, where the gases are cooled on being mixed with air, thus lowering the tank's thermal revealing factors.

Air for the fuel system passes through two air cleaners attached to two sides of the engine and connected with turbocompressors by short pipes. The air cleaners are two-stage. Initially the air passes through cyclone dust collectors (coarse cleaning), then enters cassettes with filter elements (fine cleaning).

At the same time, as West German specialists admit, the diesel engine of the Leopard-2 tank provides insufficiently good pickup, and in this connection work continues to improve it. In particular, studies were made to obtain greater power with a given working volume and to improve acceleration characteristics, results of which were planned to be used in developing any type of diesel engine. For example, a turbocompressor was developed with an adjustable turbine nozzle assembly which noticeably improved engine characteristics under partial load conditions. Specific fuel consumption was reduced five percent and the range of optimum specific consumption was widened somewhat. The time for reaching nominal rpm was reduced 12 percent. It is reported that use of the auxiliary (afterburning) combustion chamber and turbocompressor significantly improved acceleration characteristics, bringing them close to corresponding indicators of conventional diesels (without supercharging). The developers assert that the presence of this chamber led only to a slight increase in fuel consumption while idling, but fuel consumption did not change with the tank moving along broken terrain, since the engine takes a load almost immediately. In case the auxiliary combustion chamber malfunctions the engine continues to operate as a conventional diesel with turbo-supercharging. This design solution permitted increasing the mean effective pressure of diesels with single-stage supercharging to 20 kg/cm^2 practically without degrading acceleration conditions.

In the opinion of foreign specialists, successful results of tests of the MB 880 type-size series engines permitted a reduction at the present time of requirements for increasing the working volume of cylinders, which must be sufficiently large in order to have the necessary operating life and

operational reliability of the engine. Meanwhile other technical problems appeared. Above all it was a need to assure mechanical strength of the turbocompressor operating under conditions of high temperatures and large mechanical stresses. Now West German MB 880 series engines are being viewed as a possible variant of the power plant of future armored combat vehicles inasmuch as, in comparison with the MB 870 family, they are distinguished by higher overall capacity and lesser specific weight, and the horsepower of the 12-cylinder models approaches 1,800.

While primary attention in the FRG was given to improving torque characteristics in developing diesel engines, studies were being conducted in other western countries aimed above all at improving nominal capacity. As a result of 15 years of work the American firm of Teledyne Continental Motors developed the V-12 four-stroke AVCR-1360-2 diesel engine with air cooling, a combination supercharging system, and cooling of the forced air. A piston design providing for automatic adjustment of compression ratio within the limits of from 19.5 to 1[1] is a feature of the engine. The engine's piston consists of a body and outer sleeve. The relative movement of its elements which provides for the change in compression ratio is accomplished by a hydraulic system, which includes oil chambers, canals, valves and calibrated ports. It is noted that the maximum compression ratio permitted a reliable engine start at low ambient temperature. Maintaining a high compression ratio with the engine operating at a small load contributes to a favorable occurrence of the combustion process. The compression ratio automatically drops as power increases.

The AVCR-1360-2 engine was installed in prototypes of the American XM1 tank but, when preference was given to a tank with a gas-turbine engine in 1976 as a result of testing, development financing was halted temporarily. In May 1980 the U.S. Defense Department again concluded a contract with the firm providing for completion of its design for use as a reserve variant of the engine for the M1 Abrams tank.

American M60 series tanks use AVDS-1790 family diesel engines. Series production of the base model began in 1960, but it soon was modernized, produced under the designation AVDS-1790-2A (Fig. 2 [figure not reproduced]) and installed in the M60, M60A1, M60A2 and M48A5 tanks and in special vehicles based on them. In the 1970's work to improve it was carried out, aimed chiefly at improving reliability (the AVDS-1790-2C modernized model is being used in the M60A3 tank). The AVDS-1790-5A engine also was produced, with capacity increased to 900 hp and intended for installation in the Israeli Merkava tanks.

In Great Britain the V-12 four-stroke 12V-1200 Condor diesel engine with turbo-supercharger (Fig. 3 [figure not reproduced]) is installed in the new Challenger tank. Its improved model with a capacity of 1,500 hp already has been developed.

The French AMX-30 main battle tanks presently use the HS-110 V-12 four-stroke multifuel diesel engine (Fig. 4 [figure not reproduced]) with liquid cooling and turbo-supercharging. The cylinders are horizontally opposed. A

distinguishing feature of the design is oil cooling of the pistons with a separate oil circulation system. Cavities for circulation of coolant are located in the cylinder head between valves for more intensive head cooling. Rotation velocity of the cooling system fan, activated by an electromagnetic clutch, is regulated depending on ambient temperature. The engine is adapted for operating on diesel fuel, kerosene and gasoline. Conversion from one form of fuel to another is done mechanically by turning a special graduated head,which changes the fuel supply by weight and engine power accordingly.

As noted in the foreign press, Japanese specialists have achieved considerable success in the development of tank diesel engines. Series production of four-, six- and ten-cylinder air-cooled engines was set up at plants of the Mitsubishi firm in the mid-1970's, with the latter engine (10ZF-21WT, Fig. 5 [figure not reproduced]) installed in the "74" main battle tank. It can operate on diesel fuel and aviation kerosene. Although high-octane gasoline also can be used, engine capacity drops 20-25 percent.

The supercharging system includes two turbocompressors mechanically connected to the crankshaft. Seven percent of engine capacity is used to drive the turbocompressor at maximum power. A two-stage combined supercharging system consisting of a turbocompressor and gear-driven, positive-displacement supercharger was developed later to improve the effectiveness of cylinder scavenging and the pickup. Engine cylinders are cooled by two axial forcing fans mounted vertically in the flare between cylinder blocks. At maximum rpm both fans consume up to 120 hp, or some 16 percent of the engine's total output.

Some success has been achieved abroad in recent years in the development of gas-turbine engines (GTD). The United States, Japan and a number of European countries are conducting intensive work to complete prototypes and improve series models. As foreign specialists note, the GTD is easily started in low temperatures and requires no warm-up after starting. In comparison with diesel engines, it has greater overall capacity, better satisfies the demand for multifuel capability, and is simpler from the design standpoint. Its operating life is 2-3 times greater than this indicator for a diesel with the very same capacity, which is explained by the presence of a considerably lesser number of rotating parts and the absence of parts with reciprocating motion which give rise to the action of inertial forces reducing the engine's longevity.

At the same time, the GTD's also have certain deficiencies, the main one considered to be large fuel consumption. An improvement in GTD fuel economy under partial load conditions is achieved by using heat-exchangers in combination with an adjustable power turbine nozzle assembly. When gas-turbine engines are used in tanks considerably higher demands are placed on the air-cleaning system, especially under conditions of increased dust. Preference is given to combination air cleaners consisting of an inertial dust cleaner and a contact filter. Increased air consumption complicates the underwater operation of tanks.

Considerable attention also is given to reducing the cost of a GTD, inasmuch as its production now is approximately twice as costly as for a diesel. Western specialists believe, however, that the cost of a GTD with heat exchanger can compare with the same indicator for a diesel when the design and production technology have been worked out.

At the present time the AGT-1500 gas-turbine engine (Fig. 6 [figure not reproduced]) has been installed in the new American M1 Abrams tank for the first time in foreign tank construction. During the period 1978-1980 changes aimed at reducing fuel consumption, improving reliability, increasing service life and reducing expenditures for maintenance and repair were made to its design based on the results of performance testing.

The AGT-1500 is a triple-shaft engine with a dual-rotor axial-centrifugal compressor, an individual tangentially arranged combustion chamber, and double-stage power turbine with adjustable first stage nozzle assembly and fixed annular plate exchanger. The first-stage nozzle vanes and rotor blades of the high-pressure turbine are cooled by air taken from the compressor outlet and supplied through ports to the blade roots. Maximum gas temperature in the turbine is 1,193°C.

A reduction gear located within the heat exchanger housing reduces rpm at the GTD's output shaft to 3,000. A reduction in rated turbine revolutions from 26,400 to 22,500 rpm permitted replacing the previously used two-stage planetary reduction gear with a single-stage gear.

A conventional hydromechanical fuel-flow regulator is used in the GTD. An electronic control system provides the necessary sequence of operations in starting the engine, and it shuts the engine off in case permissible temperatures or rotor rpm are exceeded.

A fixed cylindrical-drum plate exchanger is installed in the engine. It is assembled from annular plates made of stainless steel, welded along the outside, fastened with longitudinal coupling bolts and forming a cylindrical drum which encompasses the turbine diffuser. Gas and air ducts are formed by openings in the plates and by the spaces between them. Working pressure in the heat exchanger is 14.76 kg/cm^2 and the heat regeneration rate is 72 percent with the engine operating at rated service power (70 percent of maximum). The compactness of the heat exchanger and its rational configuration permitted developers to achieve relatively small size of the GTD.

Work has been under way since 1979 to increase the capacity of the AGT-1500 engine to 1,800 hp without substantial design changes. American specialists assert that this indicator subsequently may be taken to 2,000 hp.

Foreign experts believe that a result of the work being done in the area of improving existing tank power plants and developing future ones of the next generation may be the appearance in the future of new engines, both tank diesel and gas-turbine engines, which substantially surpass series-produced models

in their characteristics. One version of such a power plant may be a diesel engine with a "hyperbar" system being developed by French specialists. Its basic principle is the use of higher supercharging pressure in order to have a significant increase in power with a simultaneous improvement in torque characteristics. This method includes a substantial reduction in compression ratio (to 7) and use of high supercharge pressure which gives a mean effective pressure up to 30 kg/cm^2. In view of the fact that it is practically impossible to start a diesel engine with such a low compression ratio, a combustion chamber is mounted ahead of the turbocompressor turbine which activates it regardless of the presence of exhaust gases.

Work to develop so-called adiabatic engines has been conducted across a broad front in the United States of late. A feature of the engines is actual rejection or a substantial simplification of the cooling system, achieved by using special ceramic materials in the design which are resistant to high temperatures. As the foreign press reports, this will permit a 50 percent improvement in KPD [efficiency], a 30-40 percent reduction in fuel consumption and a 40 percent decrease in engine weight. The firm of Cummins now already has developed a 250 hp prototype. It is believed that it is technically possible to make a 500-600 hp engine on its basis, but it is planned to develop a 1,500-2,000 hp adiabatic engine for main battle tanks of the next generation.

Foreign specialists also include the Wankel rotary engine among future tank engines.

The active development of tank engines continuing in capitalist countries, and in countries included in the NATO bloc above all, indicates the intent of western militarist circles to increase the tactical features of tanks, which are one of the most important means for implementing aggressive plans directed against the USSR and countries of the socialist community.

6904
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ADATS MULTIPURPOSE MISSILE SYSTEM

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 7, Jul 84 (signed to press 10 Jul 84) pp 41-43

[Article by Col V. Viktorov: "Multipurpose Missile System"]

[Text] In 1980 the Swiss firm of Oerlikon developed the ADATS (air defense antitank system) multipurpose missile system jointly with the American firm of Martin Marietta. Judging from foreign press reports, it is intended for combating fast low-flying aircraft, fire support helicopters, reconnaissance drones, and ground-based armored targets. It is noted that the system is capable of hitting airborne targets at ranges up to 8 km and ground targets up to 6 km. The minimum range of fire is 500 m. The system's modular design permits its installation on tracked or wheeled vehicles. In particular, a prototype was developed based on the American M113A2 tracked APC (Fig. 1 [figure not reproduced]).

In accordance with the development task, the system is mobile, self-contained and air-transportable; it has a short reaction time and sufficiently high antijam capability. It consists of the following basic elements: rotating turret with eight ready-to-fire missiles in transport-launch containers; pulse-Doppler radar with 360° cover and identification friend or foe [IFF] equipment; electro-optical target detection and tracking device consisting of an infrared set and television camera; carbon dioxide laser for missile guidance; neodymium-YAG [yttrium-aluminum garnet] laser rangefinder.

The missile (2 m long, 152 mm in diameter, with a launch weight of 51 kg, Fig. 2) is made with a normal aerodynamic configuration and has a solid propellant motor with two modes of operation. It is noted that because of the high maximum flight speed (Mach 3) it is capable of hitting moving targets visible for a short time interval over rather long ranges. A shaped-charge fragmentation warhead (weighing 12 kg) is used in the missile and it penetrates armor up to 900 mm thick. Two types of fuzes are used: an electronic proximity fuze for firing against airborne targets and an impact fuze against ground armored vehicles.

The 360° pulse-Doppler radar developed by an Italian affiliate of the Swiss firm of Contravers is capable of detecting airborne targets flying at

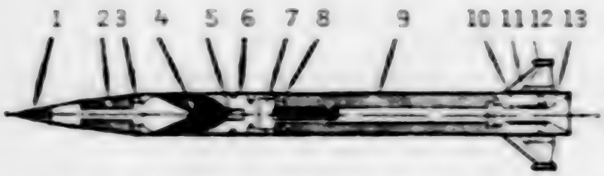

Fig. 2. Schematic diagram of ADATS system missile:

1. Impact fuze
2. Electronic control equipment
3. Gyroscope
4. Shaped-charge fragmentation warhead
5. Warhead safe-arm mechanism
6. Proximity fuze
7. Safety device
8. Detonator
9. Solid propellant rocket motor
10. Control linkages
11. Folding wing
12. Detector (laser emission receiver)
13. Nozzle

altitudes up to 5,000 m at ranges greater than 20 km, and detecting ground targets up to 6 km (depending on terrain relief). It can track up to 10 targets simultaneously.

The system's combat team consists of three persons: commander, tracking operator and driver-mechanic (he also is the missile guidance operator). The system's combat work occurs as follows. After airborne targets are detected by the 360° radar they are identified. Data on them go to the EVM [electronic computer] for assessment of the degree of threat and determination of the sequence of engagement. Results are displayed on the combat team commander's control console screen. After a target is selected for destruction the turret automatically rotates in its direction. The operator locks on using the infrared equipment or television camera depending on visibility conditions. In the developers' opinion, such a method of tracking using passive, i.e., non-emitting, equipment increases the system's electronic countercountermeasures. The range to a target is determined by the laser rangefinder or 360° radar and is constantly corrected during tracking. As soon as the target enters the killing zone the missile is automatically launched.

The missile is guided by a combination method: initially by command guidance, and then by laser beam. In the first stage, when the motor is operating, the missile is tracked by the electro-optical device and controlled by commands produced by the system EVM with consideration for the relative position of missile and target and sent to the missile in the form of codes by modulation of the laser beam. It is noted that use of the command guidance method during motor operation makes it possible to guide the missile along near-optimum trajectories, especially when firing against targets at short range.

After fuel burns out in the motor the second stage begins in which the very same laser beam is used (but this time without modulation) as a reference and the missile is guided precisely to the target. The two detectors located in the missile tail receive the laser emission, which the onboard EVM converts into missile control surface commands and as a result the missile flies along the laser beam, i.e., to the target. American specialists believe that the transition to laser beam guidance at considerable distances provides greater accuracy than command guidance. Fire against ground armored targets is done in a similar manner, but the missile's proximity fuze is blocked out to preclude it from being triggered.

The first launches of the missiles for working out the guidance system were conducted in 1981 at the White Sands Missile Range in the United States. Direct hits of the missile on targets at ranges of some 4 km were noted during the last three firing tests held at the U.S. Air Force's Eglin range last year (Fig. 3 [figure not reproduced]). The first launch was against a target simulating a helicopter, and the second and third were against an M47 tank, in the last instance using a real warhead (the hollow-charge jet penetrated both sides of the tank, causing considerable damage within).

It was planned to hold around 30 more missile launches by early 1984. They were to be made against various airborne and ground targets at various ranges to test system characteristics to the full extent. It was planned to test two system prototypes made on the basis of the M113A2 tracked APC. In addition to the missiles on the launcher, they have another eight missiles contained in the hull.

According to foreign press reports, the experimental manufacture of missiles for the ADATS system began recently at Oerlikon enterprises. R&D expenditures for its four-year development period were around $200,000. It is expected that the cost of the multipurpose system will be comparable to the cost of the British Rapier ZRK [surface-to-air missile system]. The United States and some NATO bloc countries have expressed an interest in acquiring it.

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ORGANIZATION OF AIR FORCE COORDINATION WITH GROUND FORCES

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 7, Jul 84 (signed to press 10 Jul 84) pp 45-47

[Article by Lt Col S. Myachkov: "Organization of Air Force Coordination with Ground Forces (In Providing Them Close-Support)"]

[Text] The command of NATO's Joint Armed Forces (OVS) attaches great importance to increasing the effectiveness of coordination among ground troops and air forces during combat actions. As pointed out in the foreign press, providing close air support to ground troops on the battlefield is a very important element of such coordination. Basic NATO guidance documents which regulate the combat employment of tactical aviation cite the following fundamental arrangement for its organization and implementation. The commanders of allied tactical air forces [ATAF] plan the allocation of flying resources for accomplishing this mission on the basis of a directive from the commander of allied air forces in the TVD [theater of military operations]. Subsequent planning is carried out in lower headquarters in conformity with this plan, with special attention given to assuring the coordination of actions by units [soyedineniye and chast'] of ground troops and air forces.

Initial data for drawing up a close air support plan consist of the routine requests, which can be submitted by any command echelon from battalion up to and including army corps. They principally pass according to the following scheme.

In preparing to accomplish a combat mission assigned him, the commander of a forward battalion determines the requirement for air support and submits a request to a forward air controller [FAC], who sends it to the senior member of the tactical air control team (KUTA) who performs the functions of an air force liaison officer in the corresponding brigade of ground troops. The latter submits the request to the KUTA with the ground division. It then goes to a close air support operations center (TsNAP, although lately the western press frequently has been calling it an air support operations center--OTsAP), set up with a combat operations control center (TsUBD) of the army corps, then to the air combat operations control center (TsUBDA) organized with the ATAF headquarters (see diagram). At each stage it is examined and coordinated with other requests.

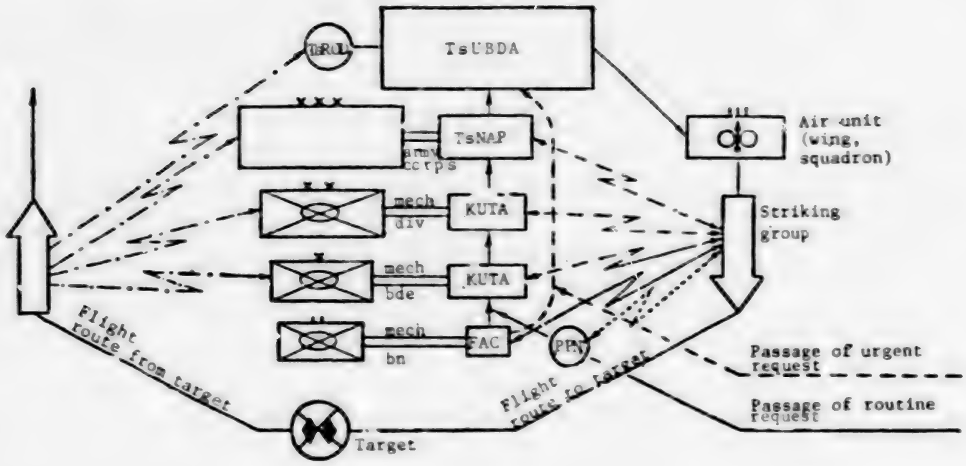

Diagram of the passage of requests for close air support and of communications between control entities and a group of attack aircraft

Based on these requests the ATAF headquarters makes a distribution of tactical air forces and resources and assigns the necessary flying hours. The plan for executing the requests is sent in the form of instructions to the TsUBDA, on which all responsibility rests from that moment. The order for air support is drawn up here. It is transmitted to the commanders of appropriate air units as well as (in the concerned unit) the TsNAP, KUTA and FAC. The order gives the allocated detail of aircraft, flight speeds, altitudes and routes, time of arrival in the target area, possible payload variants and methods for attacking the given strike objectives, as well as certain other data. The information is transmitted in the form of formatted messages over radio or wire communications channels.

The air unit commander assigns the combat mission to crews earmarked for executing the request after familiarizing them with the ground situation in the combat area (the latter is done by the ground forces' liaison officer located at the air unit headquarters).

During the flight to the target the commander of the tactical fighter group maintains constant radio communications with the TsNAP and air control entities set up at division headquarters and at the brigade command posts, informing them about the overflight of prearranged check reference points (lines). He has the opportunity of receiving from them additional information about the situation or commands for retargeting to accomplish more important and more urgent missions. On the last leg of the flight route the group commander contacts the FAC or forward control post (PPN) by radio and receives updated information from them about the nature of the target, its location, the direction of approach to the target, method of delivering the attack and friendly troop situation.

After mission accomplishment and during the flight to the destination airfield, the group commander reports by radio the time the attack was delivered and its results. The report is received by the radio direction-finding and data processing center (TsROD) at the TsUBDA and then it is passed to all interested echelons. Officers of the TsNAP and KUTA can monitor it simultaneously.

After returning to the airfield the group commander gives a detailed briefing to the commander in the presence of the ground forces' liaison officer about how the mission was accomplished and he gives other additional information which may be of interest.

In case a crisis situation arises in the sector of the battalion conducting combat actions (an attack by superior enemy forces, the threat of a tank penetration and so on), the battalion commander submits a request for urgent air support. The forward air controller located here sends the request directly to the TsNAP, bypassing the KUTA of the ground brigade and division (although the latter have an opportunity to know that the request has been sent, since their radios operate in the very same radio net and on the very same frequencies as the aforementioned subscribers). This center's officer, who is responsible for organizing air support, examines the request and, if a tactical fighter reserve is present, he sends the request to the TsUBDA (in the form of a requisition for assignment of aircraft). If the request is deemed substantiated there, one of the air units is given an order to execute it. Appropriate command echelons of ground troops including the battalion commander who submitted the request are immediately informed of the decision reached.

As a rule, the combat mission for executing urgent air support is assigned to crews who are in 15-minute readiness or in a patrol zone. Pilots receive a briefing and familiarization with the ground situation while in the aircraft on the ground or in the air.

The crews' further actions (the flight to the area for accomplishing the combat mission, receipt of latest data about the nature of the target, report on results of a strike delivered) are similar to actions in satisfying a request for routine air support.

The western press has reported that in addition to the aforementioned control entities, representatives of ground troops are constantly located at headquarters of air formations [ob"yedineniye] and units [soyedineniye and chast'] for organizing closer coordination between the air force and ground troops. For example, as follows from West German military press reports, there are ground forces' liaison groups constantly at the headquarters of air commands, divisions and fighter-bomber squadrons of the Bundeswehr's Luftwaffe at the present time. Their composition depends on the level of the headquarters and nature of missions being accomplished by coordinating elements.

A liaison group at a fighter-bomber squadron headquarters usually consists of three persons: the group chief--a liaison officer (in the rank of major or

lieutenant colonel), his assistant (an NCO) and a radio operator (a private). The group has its own radio communications equipment (most often this is a special vehicle with a radio).

This group's basic functions include the following:

--Assignment of specific missions to air subunits for giving close air support to ground units;

--Consulting with the air force command element on the ground situation in the combat area (situation and nature of actions of friendly and enemy troops);

--Briefing the aircraft crews before a sortie for accomplishing a mission (the group gives the location and a brief description of targets to be destroyed, nature of the terrain, system for marking the friendly forward edge, location of enemy air defense weapons, a brief description of them and so on).

The group regularly keeps a detailed map of the situation in the vicinity of that ground unit [soyedineniye] with which the given fighter-bomber squadron is coordinating (identical maps are kept at the squadron [eskadra] command post and in the air squadrons [eskadril'ya]). It is for this same purpose that the liaison officer asks detailed questions of flight crews returning from a combat assignment about the course and results of mission accomplishment, changes in the position of opposing sides, the appearance of new enemy units and subunits in the combat area and so on.

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WESTERN TACTICAL RECONNAISSANCE AIRCRAFT

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 7, Jul 84 (signed to press 10 Jul 84) pp 53-57

[Article by Col (Res) B. Ivanov: "Foreign Reconnaissance Aircraft"; passages rendered in all capital letters printed in boldface in source]

[Text] The previous issue of the journal told about strategic reconnaissance aircraft presently in the inventory of air forces of the United States, Great Britain and France. Within the overall system of aggressive militaristic preparations by the main imperialist states, an important role also is given to the development of tactical aerial reconnaissance capabilities, including manned reconnaissance aircraft. In the opinion of NATO specialists, they provide for high effectiveness in collecting information with a sufficient degree of validity, which acquires special importance under conditions of a rapidly changing combat situation where the need arises for prompt determination of troop concentrations and movements, for making a search for mobile nuclear missile weapons, and for identifying objectives and targets for the delivery of strikes.

Judging from foreign press reports, reconnaissance versions of practically all tactical fighters now have been developed abroad. The aircraft are fitted out with varied radar, radiotechnical and infrared reconnaissance equipment, with aerial cameras, and with means for illuminating the terrain and targets during night photography. This equipment usually is installed in the fuselage of specially developed reconnaissance aircraft. It is accommodated in suspended pods on tactical fighters assigned for conducting aerial reconnaissance in combat units.* The following provides information about foreign tactical reconnaissance aircraft based on articles published in the western press.

The basic means for tactical aerial reconnaissance in the United States is the RF-4C reconnaissance aircraft (Fig. 1 [figure not reproduced]). It was developed on the basis of the F-4C Phantom-2 fighter and is intended for conducting aerial reconnaissance day or night in simple and adverse weather conditions, for final reconnaissance of targets, for target designation and for registering results of the delivery of air strikes. Its series production ended in

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*For more detail about them see ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No 12, 1983, pp 59-65--Ed.

1972, with a total of some 500 aircraft built. In addition to the United States, the aircraft is in the inventory of the Spanish Air Force. The RF-4C has a maximum take-off weight of 24.7 tons, maximum flight speed of 2,500 km/hr at an altitude of 12,000 m, a service ceiling of 20,000 m and a ferry range of 3,700 km. The power plant consists of two TRD's [turbojet engines], each with a thrust of 7,700 kg with afterburning.

The basic reconnaissance equipment is consolidated into three systems controlled and monitored by the navigator-operator. It includes a side-looking radar [SLAR], infrared [IR] equipment with linear scanning, and various aerial cameras (AFA's). Until recently the aircraft was equipped with the AN/APQ-102 SLAR, which permits conducting aerial reconnaissance of targets at a distance up to 8 km (at a flight altitude of 750 m) or up to 80 km (15,000 m) and picking out moving targets with poor contrast against the background of terrain. The image received is photographed from the radar display scope on photographic film, which is processed after the aircraft lands. The foreign press notes that some RF-4C's use the more sophisticated AN/APD-10 SLAR with synthetic antenna aperture and recording equipment which provides a terrain image on 241-mm film. After delivery to the ground the exposed photographic film is automatically processed. In addition, video data and coded parameters of the photography can be passed from the aircraft to a ground processing center and thus shorten the time for delivering intelligence to interested echelons.

The AN/AAS-18 IR set with linear scanning is installed in the RF-4C. Lately it is being replaced with the more sophisticated AN/AAD-5 with increased resolution. Photographic equipment includes the panoramic KA-55A (for daytime photography from high altitude), KA-56 (from low altitude), KS-87 (for day and night photography) and the long-focus KS-127A AFA's. In accordance with existing modernization plans it is intended to equip some of the aircraft with the AN/ALQ-125 TEREC automatic electronic intelligence set, capable of automatically detecting and determining the location of enemy air defense radars. In addition, the AN/ALR-17 reconnaissance receiver, AN/APR-25 warning receiver and AN/ALQ-101 active jammer can be installed aboard RF-4C reconnaissance aircraft.

In addition to the RF-4C the United States also produces other reconnaissance modifications of the Phantom aircraft, including the RF-4B and RF-4E. The first was developed for U.S. Marine aviation; the make-up of its reconnaissance equipment is the very same as the RF-4C. A total of 46 RF-4B aircraft were built. After modernization, the AN/APD-10 SLAR with a maximum target detection range of 90 km and the AN/AAD-5 IR set are accommodated in it. The RF-4E aircraft (during 1967-1979 over 140 were built) were exported to the FRG, Greece, Turkey, Israel, Iran and Japan. They are outfitted with radar, IR and photo reconnaissance equipment.

The OV-10A BRONCO light guidance and target designation aircraft is used for conducting reconnaissance in forward combat areas and for vectoring tactical aircraft to detected targets. Some 150 aircraft were built for the U.S. Air Force. During 1966-1978 it was produced in several modifications and

supplied to air forces of other countries, particularly the FRG, Thailand, the Philippines, South Korea, Morocco, Venezuela and Indonesia. The OV-10A has a maximum take-off weight of 6,550 kg, maximum speed of 445 km/hr at an altitude of 3,000 m, service ceiling of 8,200 m and operating radius of 370 km. The power plant includes two 715 hp turboprop engines. The AN/APS-94A SLAR, IR set and KA-60 and KA-63 panoramic cameras can be installed in it as reconnaissance equipment.

It is planned to modify the F-18 Hornet fighter for conducting aerial reconnaissance. In it the built-in Vulcan gun will be replaced by a platform with reconnaissance equipment, which will accommodate one KS-87B AFA for oblique photography, a panoramic KA-99 for low and medium altitude photography and the AN/AAD-5 IR set. It is believed that reconnaissance equipment can be installed in a combat fighter in air units in eight hours. It was planned to conduct tests of the RF-18 reconnaissance aircraft in 1983 and to deliver the first series-produced aircraft in 1986. The foreign press also notes that American specialists are studying the question of developing a new reconnaissance aircraft based on the multirole F-16 Fighting Falcon tactical fighter for replacing the RF-4C basic reconnaissance aircraft in the 1990's.

Four of the existing 20 F-111C fighter-bombers were refitted as RF-111C reconnaissance aircraft (Fig. 2 [figure not reproduced]) in the United States for the Australian Air Force during 1979-1980. The reconnaissance equipment of the RF-111C includes one panoramic KA-56E AFA for low-altitude photography, a KS-87C for high-altitude overhead photography, a panoramic KA-93A AFA for high-altitude photography, an AN/AAD-5 IR set with linear scanning and two television cameras.

The British Air Force uses the Jaguar-GR.1 fighter-bombers and the Canberra-PR.7 and PR.9 reconnaissance aircraft for performing tactical aerial reconnaissance. The JAGUAR'S reconnaissance equipment (its maximum take-off weight is around 15,000 kg, maximum flight speed is 1,700 km/hr at an altitude of 11,000 m, service ceiling is 14,000 m and radius of operation is 570-810 km depending on flight profile) is accommodated in a suspended pod beneath the fuselage. It includes 2-3 F.95 MK.10 AFA's for low-altitude photography and one F.95 MK.7 for oblique photography. One F.126 AFA with a lens focal length of 152 mm for medium-altitude photography can be installed in place of the F.95 MK.10 AFA. A type 401 IR set with linear scanning is used for conducting reconnaissance in adverse weather conditions and at night. As a rule, a reconnaissance flight is made at extremely low altitude using reference point data previously entered in the aircraft's sighting-navigation system. As the western press reports, the first report about detected reconnaissance targets was sent 45 minutes after landing and switching off the engine in exercises which were held. It was noted that all five cassettes, each with 76 m of 70-mm photographic film, were delivered to a laboratory in 10 minutes, where the films were processed at a rate of 36.5 m/min.

The CANBERRA reconnaissance aircraft (Fig. 3 [figure not reproduced]) are specialized aircraft for conducting high-altitude aerial reconnaissance. The two-place Canberra-PR.9 has a maximum take-off weight of around 25 tons, maximum flight speed of 900 km/hr at an altitude of 12,000 m, service ceiling

around 15,000 m and ferry range of 5,800 km. The F.95 aerial cameras for daylight photography and F.97 cameras for nighttime photography from high altitudes are the primary means of reconnaissance.

It is also reported that the HARRIER vertical take-off and landing aircraft can be used for performing reconnaissance. In this case a pod is suspended beneath their fuselage which contains four F.95 AFA's for oblique photography and one F.135 AFA for overhead photography. As a rule photographic reconnaissance is conducted from altitudes of 60-600 m at a flight speed of up to 1,000 km/hr.

The RF-4E reconnaissance aircraft are in the FRG Luftwaffe inventory. Their reconnaissance equipment includes up to five AFA's, the AN/AAS-18 IR set and a SLAR with a system for data transmission to ground processing centers. At the present time a modernization program is being carried out on these aircraft which envisages an improvement in their reconnaissance and attack capabilities by outfitting them with an improved AN/AAD-5 IR set, a weapon control system with digital EVM [electronic computer], optical sight and underwing stations for suspending bombs with an overall weight up to 2,300 kg. It is also reported that it is planned to assign missions of conducting aerial reconnaissance of the battlefield in the future to the ALPHA JET light attack aircraft, on which it is planned to suspend a pod with photographic equipment.

The French Air Force has the MIRAGE-3R AND -3RD reconnaissance aircraft, which are versions of the Mirage-3E tactical fighter. In addition to France, these aircraft are in the inventory of air forces of Pakistan (the MIRAGE-3RP modification), YuAR [Republic of South Africa](MIRAGE-3RZ AND -3R2Z) and Switzerland (MIRAGE-3RS, Fig. 4 [figure not reproduced]). A total of more than 150 Mirage-3 reconnaissance aircraft of various modifications were built in 1963. The maximum take-off weight of the Mirage-3R is 13,700 kg, maximum speed near the ground is 1,390 km/hr, the service ceiling is 17,000 m and radius of action is up to 600 km. Five AFA's intended for photographic reconnaissance from low, medium and high altitudes are installed in the nose. Since 1971 the aircraft have been fitted additionally with the Cyclope IR set which allows performing reconnaissance at altitudes of 100-2,000 m with a reproduction of a thermal image of the terrain and targets on a 70-mm film, and since 1976 some of the aircraft have been fitted with the more advanced Super Cyclope IR set.

The MIRAGE-3RD reconnaissance aircraft differs from the previous aircraft by its more sophisticated equipment. In particular, the Omera-33 and -40 AFA's, an improved Doppler navigation system and a SLAR are installed in it. It is also planned to accommodate the Cyclope IR set and to suspend two 1,700 liter fuel tanks.

The French Air Force command is taking steps to renew the existing inventory of reconnaissance aircraft, considering that the bulk of them have been operated for 15-20 years now and, despite modernization, their characteristics and equipment do not meet the increasingly complex reconnaissance missions. For example, a new reconnaissance aircraft, the MIRAGE-F.1CR (see color insert [color insert not reproduced]) has been developed on the basis of the Mirage-F.1C fighter-interceptor. It is planned to have it replace the

Mirage-3 type reconnaissance aircraft. It is believed that the Mirage-F.1CR has higher performance characteristics and is outfitted with more sophisticated equipment, which will permit it to perform reconnaissance missions successfully. Its power plant consists of one Atar-9K50 TRD with a thrust of 7,200 kg with afterburning. It is noted that the duration, range and endurance of performing aerial reconnaissance is improved thanks to the use of an aerial refueling system, and pressure filling of integral fuel tanks (it takes around six minutes) and the compact accommodation of equipment reduce the preparation time for a repeat sortie to 15 minutes. In the opinion of French specialists, the aircraft's better characteristics make it easier to search for and penetrate to reconnoitered targets, and the high use of high-lift devices and the use of medium-pressure tires permit the aircraft to operate from forward field airfields.

The reconnaissance equipment accommodated in the fuselage includes the Omera-40 and Omera-35 AFA's and an IR system. The Mirage-F.1CR can carry reconnaissance pods beneath the fuselage and wing with a long-focus AFA, electro-optical equipment, SLAR, illumination devices for nighttime photography, as well as electronic intelligence equipment and electronic countermeasures equipment. Sixty-two aircraft were ordered for the French Air Force and the deliveries of series-produced aircraft to the troops began in 1983.

The air forces of Italy, the Netherlands and Taiwan have the RF-104G reconnaissance aircraft in their inventory. They have a maximum take-off weight of 13.6 tons, maximum speed of 2,330 km/hr at an altitude of 11,000 km, a service ceiling over 17,000 km and maximum radius of action of 1,100 km. The basic reconnaissance equipment consists of three KS-87B AFA's for day and night photography, and the TA-7M2 AFA is used for photoreconnaissance from extremely low altitude. The RF-104G aircraft of the Italian and Netherlands air forces use the Orpheus suspended pod, which includes an IR set and up to five TA-8M AFA's.

Foreign military specialists believe that in the mid-1980's reconnaissance aircraft of Great Britain, the FRG and Italy will be strengthened by use of the reconnaissance version of the TORNADO fighter-bomber. Its automatic terrain following system will make it possible to make flights at transonic speeds and at altitudes of 60-150 m in all weather conditions, hindering detection and intercept by the enemy or reducing to a minimum the time for taking countermeasures. It is planned to equip the aircraft with a future warning receiver and EW equipment for protection against enemy air defense weapons while performing reconnaissance flights, and it will have potential self-defense capabilities thanks to the presence of built-in 27-mm guns and air-to-air UR [guided missiles].

The British Air Force command plans to form a reconnaissance squadron of Tornado aircraft which will replace a squadron of Jaguar-GR.1 reconnaissance aircraft stationed on FRG territory. In Italy the reconnaissance version of the Tornado is to replace the RF-104G. The FRG Luftwaffe is given the mission of having the Tornado provide aerial reconnaissance to a depth up to 780 km with the possibility of performing a standing patrol at this distance for 15 minutes. A suspended pod with reconnaissance equipment including two AFA's, an

IR set and a data processing and transmission device has been developed for the aircraft. It is assumed that the pod's modular design will reduce the time for preparing and servicing the equipment.

In addition to the Tornado, it is planned to use the developmental AMX fighter for battlefield reconnaissance in the future in the Italian Air Force. It is planned to accommodate photographic equipment in its nose and a pod with an IR set under the fuselage. Equipped with a built-in 20-mm cannon and two air-to-air UR, the aircraft will be able to perform reconnaissance within a radius of 300-350 km.

The Belgian Air Force has the MIRAGE-5BR reconnaissance aircraft in the inventory. They have a maximum take-off weight of 13.5 tons, a maximum speed near the ground of 1,300 km/hr, a service ceiling of 17,000 m and radius of action of 650-1,200 km (depending on flight profile). The nose accommodates five aerial cameras, and use of an IR set also is possible.

The Danish Air Force uses the RF-35 DRAKEN reconnaissance aircraft for reconnaissance. It is produced by Sweden (it has a maximum take-off weight of 15 tons, maximum speed of 2,100 km/hr at an altitude of 11,000 m, service ceiling of 18,000 m and maximum radius of action of 1,100 km).

The American RF-5A reconnaissance aircraft developed on the basis of the F-5A fighter has become widespread in the air forces of a number of foreign countries, particularly Greece, Norway, Turkey, Spain, Thailand and Morocco. Its four KS-92 AFA's (each with a film supply of 30 m) provide oblique and overhead photography with overlapping. The aircraft has a maximum speed of 1,490 km/hr at an altitude of 11,000 m, a service ceiling of around 15,000 m and maximum radius of action of 900 km when performing reconnaissance with three suspended fuel tanks.

At the present time the United States has developed and is testing the new RF-5E reconnaissance aircraft (Fig. 5 [figure not reproduced]). It is distinguished by a greater selection of reconnaissance equipment and improved navigation equipment which, in the estimate of Northrop specialists, will permit it to perform reconnaissance missions more effectively than the RF-5A reconnaissance aircraft which is in the inventory. Two KS-87B AFA's are mounted as permanent reconnaissance equipment in the nose of the RF-5E for oblique photography. It is planned to install several sets of reconnaissance equipment on rapidly removable panels in order to more fully satisfy the customers' requirements for assuring performance of diverse aerial reconnaissance missions. This includes in particular the KA-95B and KA-56E panoramic AFA's and the RS-710 IR set with linear scanning for performing reconnaissance from low and medium altitude; the KA-56E panoramic AFA's for low altitude photography; and the KA-93B for photography from altitudes of 3,000-15,000 m. The western press reports that air force representatives from a number of countries are observing the progress of this aircraft's flight tests, but talks about its sale are being held for now only with Saudi Arabia and Malaysia.

The SF37 and SH37 reconnaissance aircraft developed on the basis of the AJ37 Viggen fighter-bomber and replacing the S32C Lansen and S35E Draken have been

in the Swedish Air Force inventory since 1977. The single-place SF37 is intended for performing aerial reconnaissance in any weather conditions chiefly over land. Its nose compartment accommodates four AFA's for overhead photography or four AFA's for oblique photography from low altitude, two AFA's for photography from long ranges and an IR set. The SH37 reconnaissance aircraft (Fig. 6 [figure not reproduced]) is intended primarily for performing reconnaissance over a water surface. It is provided with a search radar with camera for obtaining an image from the display screen, electronic intelligence equipment and other recording equipment. Pods with AFA's (for photography under nighttime conditions or from long ranges), with an IR system or with EW equipment can be accommodated on external suspension. Swedish reconnaissance aircraft have a maximum take-off weight of 20.5 tons, a maximum speed of 1,465 km/hr at an altitude of 300 m, a service ceiling of around 16,000 m and a radius of action of 500 km during low-altitude reconnaissance flights.

Judging from foreign press reports, that is the present status of the inventory of tactical reconnaissance aircraft in the air forces of the main foreign countries and some of the prospects for their development.

6904
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U.S. COAST GUARD

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 7, Jul 84 (signed to press 10 Jul 84) pp 64-68

[Article by Capt 1st Rank (Res) A. Markov; passages rendered in all capital letters printed in boldface in source]

[Text] The U.S. Coast Guard is one of the country's specialized services. It was created in 1915 as a result of the merging of two services--customs (in existence from 1789) and lifesaving at sea (from 1848). The lighthouse service became a part of it in 1939 and the navigation service in 1942. In its organizational structure, armament, and procedure for manning and performance of duty by personnel, the Coast Guard actually is a component of the Armed Forces, although in peacetime it belongs to the Department of Transportation. In case of war or in an emergency situation it is transferred to the Navy, where it functions with the right of a separate command with operational subordination of forces and resources to fleet commanders and VMB [naval base] commanders where they are stationed.

The Coast Guard's zone of responsibility within which its directions are mandatory for execution by ships and vessels of all states takes in U.S. territorial waters and coastal areas, and a 200-nm zone with respect to observance of fishing rules. Its authority also extends to the high seas for American merchant vessels.

According to foreign press reports, in peacetime the Coast Guard is given the following functions: monitoring the fulfillment (including the use of force) of U.S. federal laws and international rules of shipping, safeguarding and supporting navigation safety, performance of search and rescue operations and oceanographic research, navigation support for the Navy and merchant shipping, observation of the weather and ice situation, winter support to navigation, environmental protection, and keeping available forces and resources in constant readiness for transfer to the Navy.

Its command cites the following facts in emphasizing the importance of the role which the Coast Guard plays. In 1982 alone 201 vessels were detained for violation of existing U.S. laws, 3,867 tons of various drugs worth a total of approximately two billion dollars were confiscated and some 1,200 persons were arrested. In addition, more than 87,000 sea and air sorties were made to

accident locations for the purpose of sea search and rescue, almost 158,000 victims were given necessary assistance and 5,631 persons were saved.

In connection with the increase in river and sea water pollution in recent years the Coast Guard was assigned a new task for it--environmental protection. Special subunits take necessary steps to prevent the discharge of chemical substances and other harmful production wastes into the rivers and coastal areas of seas, and they clean the waters of oil and oil products (primarily the water areas of major VMB's and ports).

Judging from foreign press materials, during war the Coast Guard must accomplish the following missions in addition to those indicated: antisubmarine and antimine defense of ports and anchorages, protection of sea lines of communication in coastal waters, combating scouts and saboteurs, participation in landing operations and performance of patrol duty.

The Coast Guard is headed by a commandant (appointed by direction of the president for four years), who in peacetime is directly subordinate to the secretary of transportation and in war to the chief of naval operations. He exercises command and control through his deputy, chief of staff, and commandants of coast guard areas and districts.

Coast Guard headquarters is located in Washington. It is assigned the functions of general planning, control and coordination of operations in areas and districts as well as immediate direction of the work of central agencies and subunits. In addition, it handles matters of combat readiness, finance, construction and further development of Coast Guard forces and resources, and its ties with various governmental departments, private companies and similar services of foreign states.

The Coast Guard's organizational structure provides for a division of the continental part of the country, Alaska, island possessions and adjoining waters into areas (two) and districts (12). The areas (Atlantic and Pacific) are headed by commandants who plan and organize the conduct of major operations (search and rescue, pilotage of vessels and convoys under conditions of an ice situation and so on) involving the participation of area forces and resources operationally subordinate to them (they do not have their own) through their headquarters in New York and San Francisco. The districts also are headed by commandants to whom all forces and resources (ships, auxiliary vessels, aviation, shore subunits) within the limits of the districts are subordinate.

According to data of the reference work "Jane's," the Coast Guard's SHIP ORDER OF BATTLE as of the beginning of 1984 included some 250 ships, patrol boats and auxiliary vessels (including 49 patrol ships, 79 patrol boats, six icebreakers and six icebreaking tugs, one training motor-patrol boat and almost 110 various auxiliary vessels) as well as 2,250 pieces of base floating equipment.

The patrol ships are represented by ships of the "Hamilton" (12 units), "Campbell" (4), "Casco" (1), "Bear" (4), "Reliance" (16), "Diver" (3) and

"Cherokee" (5) classes. The most modern of them are ships of the "Bear," "Hamilton" and "Reliance" classes.

Ships of the "Bear" Class (Fig. 1 [figure not reproduced]) were commissioned during 1983-1984 (presently there are another nine units in various stages of construction). Their full load displacement is 1,780 tons, they have a length of 82.3 m, width of 11.6 m, a draft of 4.1 m, a power plant (two diesels) with a capacity of 7,000 hp which permits developing speed up to 19 knots, operating range of 6,800 nm at a speed of 13 knots, and armament including a 76-mm gun (spaces are reserved for installing the Harpoon PKR [antiship missile] and the Vulcan-Phalanx 20-mm gun system), and an HH-52A Sea Guard helicopter, which in the future can be replaced by the Mk 3 antisubmarine helicopter of the LAMPS system. The ships are fitted with GAS [sonar] with towed antenna array. There is a crew of 95, of whom 13 are officers.

Patrol ships of the "Hamilton" Class, transferred to the Coast Guard during 1967-1972, have a full load displacement of 3,050 tons, a length of 115.2 m, combination diesel-gas turbine power plant (capacity of the two gas turbines is 36,000 hp, and that of the two diesels is 7,000 hp), maximum speed of 29 knots and range of 14,000 nm at a speed of 11 knots. Their armament consists of one 127-mm gun, two 40-mm guns and two 20-mm guns, two triple torpedo tubes for antisubmarine torpedoes, and the HH-52A Sea Guard or HH-3F Pelican helicopter. They have a crew of 164, including 15 officers. The ships are fitted with GAS and are capable of accomplishing missions of combating enemy submarines.

Patrol ships of the "Reliance" Class were commissioned during 1967-1969. They have a lesser displacement (full load of 1,000 tons) and weaker armament (one 76-mm and two 40-mm guns), and a crew of 61. They have a take-off and landing pad and can take helicopters aboard.

In the opinion of American military specialists, ships of these three classes are best prepared for performing Coast Guard functions on distant approaches to the U.S. coast, and in wartime they also will be able to perform patrol duty on antisubmarine barriers and provide protection for assault force landing areas. The other ships are obsolete (they were built in prewar and wartime years) and capable of accomplishing only a limited range of missions.

Performance of patrol duty in coastal areas is assigned primarily to patrol boats (24 of the "Cape" Class, 53 of the "Point" Class and two "Sea Bird" Class air cushion vessels). The displacement of both of the first two classes is 66-105 tons, they have a speed of 20-23 knots, a range of 1,500-3,000 nm, an armament of one or two machineguns. The crew is 8-14 persons.

Air cushion vessels (Fig. 2 [figure not reproduced]) were transferred to the Coast Guard during 1982-1983. Their full weight is 145 tons, with a length of 33.5 m, a width of 8.8 m, maximum speed of over 30 knots, armament consisting of two machineguns, and a crew of 18. They are assigned to the Key West VMB (Florida) and are used for combating smugglers who deliver drugs illegally to the United States. One other such boat is being built.

The Coast Guard's icebreaker fleet includes icebreakers of the "Polar Star" (2 units), "Glacier" (1), "Wind" (2) and "Mackinaw" (1) classes as well as icebreaking tugs of the "Katmai Bay" Class (6). The latest are icebreakers of the "Polar Star" Class, which were commissioned in 1976 and 1978. Their full load displacement is 13,190 tons, with a length of 121.6 m, a width of 25.5 m, draft of 8.5 m, main propulsion plant consisting of diesel-electric and gas turbine (the capacity of six diesel generators is 18,000 hp and of three gas turbines is 60,000 hp), maximum speed on clear water of 21 knots, a range of 28,000 nm at a speed of 13 knots, and armament consisting of two 40-mm guns and two HH-52A Sea Guard helicopters. The icebreaker can negotiate ices up to 1.8 m thick at a continuous speed of 3 knots.

The icebreaking tugs (each with a displacement of 662 tons) were built during 1979-1981. They have a reinforced ice strake and can escort vessels along rivers, over lakes, in harbors and in coastal waters.

The United States received the sail-motor training vessel "Eagle" after the defeat of fascist Germany. Her full load displacement is 1,800 tons, with a length of 90 m, a width of 12 m, draft of 4.6 m, a 700 hp diesel which permits developing a speed up to 10 knots, sail area of 2,370 m^2, a range with diesels of 5,450 nm, and a crew of 65 (she can take aboard 180 cadets).

Auxiliary vessels include lights-servicing and rescue vessels, tugs, vessels for construction work and for servicing navigation lights, marks and beacons, lightships and so on.

Judging from western press reports, the Coast Guard AVIATION numbers 48 various aircraft (19 HC-130 Hercules, four HC-131's, 23 HU-25A Guardian Falcons, one VC-4A Gulfstream-1 and one VT-11A Gulfstream-2) and 110 helicopters (37 HH-3F Pelicans and 73 HH-52A Sea Guards, Fig. 3 [figure not reproduced]). Their primary missions are patroling within limits of territorial waters and the 200 nm economic zone, performance of search and rescue operations, conduct of ice reconnaissance, transporting passengers and cargoes, and monitoring the extent of pollution of the water surface by oil products. The aircraft and helicopters are outfitted with appropriate equipment and various rescue devices for performing these functions.

The aircraft and the bulk of helicopters are assigned to Coast Guard districts and based at coastal airfields. Some of the helicopters are assigned to patrol ships and icebreakers.

As the American press notes, the Coast Guard command presently is renewing the service's aviation inventory. Modern HU-25A Guardian Falcon aircraft continue to be received (Fig. 4 [figure not reproduced], replacing the obsolete HC-131, VC-4A Gulfstream-1 and VC-11A Gulfstream-2 aircraft), which are intended for performing patrol duty and for sea search and rescue. In addition, the replacement of HH-52A Sea Guard helicopters with the new HH-65A Dolphin helicopters began in 1983.

Coast Guard PERSONNEL numbered some 38,600 servicemen (including almost 5,000 officers) and approximately 5,260 civilian employees as of the end of 1983.

The Coast Guard is manned by volunteers, recruitment of whom takes place at recruiting points of Coast Guard districts. Their training takes place in their own schools as well as in naval schools. Officers are trained at the Coast Guard School (New London, Connecticut), at an officer candidate school at the Reserve Training Center (Yorktown, Virginia) and in naval educational institutions.

As with other branches of the Armed Forces, the Coast Guard has a RESERVE. Its total size is some 20,000 persons, of whom 11,800 make up the first order organized reserve. The ship reserve includes two patrol boats and an auxiliary vessel and the aviation reserve includes five HC-130 Hercules aircraft, three HU-16 Albatross and two HU-25A Guardian Falcon aircraft.

The COAST GUARD AUXILIARY SERVICE--a voluntary civilian organization of owners of floating craft (numbering up to 36,000 persons)--gives the Coast Guard help in performing its functional duties, primarily in assuring the navigating safety of recreational craft (boats, launches, yachts). Its work is monitored by appropriate departments of the Coast Guard headquarters and district headquarters.

In the opinion of foreign military specialists, transfer of the Coast Guard (in case of war) to the Navy will have a substantial effect on increasing the Navy's combat capabilities to defend sea lines of communication and to combat enemy submarines.

6904
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BRITISH SHIPBOARD COMMUNICATIONS SYSTEM

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 7, Jul 84 (signed to press 10 Jul 84) pp 68-71

[Article by Capt 3d Rank S. Cheka; passages rendered in all capital letters printed in boldface is source]

[Text] In accelerating the build-up in naval combat might, the British naval command devotes considerable attention to improving the control system and a very important element thereof, the communications system.

In recent years there has been a significant growth in the number of information sources, an increase in the volume of information passed over communications channels, and increased complexity in organizing the exchange of information. This trend is typical of strategic and tactical control systems.

The decision was made in the early 1960's to outfit ships of the basic types with HF [high frequency] communications equipment meeting modern demands. As a result of the R&D performed there appeared the first version of an integrated communications system, the ICS1, with which the aircraft carrier "Ark Royal" was fitted. The equipment of this system, intended for outfitting ships of various types, was made in four versions in conformity with tactical and technical specifications. These versions were modernized during series production.

Subsequently the tactical and technical specifications for the communications system were changed due to quality changes in the Navy's ship order of battle. The system was updated and received the new designation ICS2. It differed from the preceding system by the fact that it included a new transmitter switching device, new receiver and new wideband amplifiers.

In the late 1960's naval specialists advanced higher demands which were not able to be fulfilled during subsequent modernization of the aforementioned systems. For this reason a contract was concluded with the Marconi firm in 1971 for developing a new communications system, the ICS3. The plans were to use it to fit out all "Broadsword" Class URO [guided missile] frigates, "Sheffield" Class URO destroyers and "Leander" Class frigates, as well as "Invincible" Class antisubmarine carriers. It is planned to obtain 37 sets of

equipment up to 1985, some of which are to be installed at shore communications centers. Twelve sets of equipment have been ordered for "Kortenaer" Class URO frigates of the Netherlands Navy. The United States purchased one set for testing aboard ship and ordered another for installation ashore. According to reports from Marconi, orders also have been received from navies of countries which are not members of the NATO bloc.

The British Navy, which uses the HF band as the primary band, also has other communications equipment in the inventory. This includes the Plessey Type 1203 equipment (decimeter and meter bands) and the MSDS [Marconi space and defence systems] SCOT shipboard satellite stations (7-8 GHz) installed aboard ships of the basic types. The Marconi 2008 underwater sound communications set is used for communicating with submarines in a submerged condition.

The designation ICS3 covers a set of new generation equipment. Communications systems for various purposes satisfying specific operational requirements can be put together on its basis.

The ICS3 provides telephone, telegraph and printer communications in the 10 kHz-30 MHz band with up to 1 kw of radiated power.

In creating this system the developers were attempting to improve the frequency tuning process and the division of receiving and transmitting channels, and to reduce mutual interference between transceiving and other equipment caused by limited space for accommodating various antennas aboard ship.

The permissible channel spacing in the ICS3 was reduced to 2.5 percent, the time for shifting from frequency to frequency was reduced to one minute, flexibility was provided in output power selection, and mutual interference was reduced to a minimum.

Much attention was given to the cost of the life cycle simultaneously with an improvement in the system's tactical and technical specifications as it was developed. The design and the methods for equipment control were simplified, which allowed reducing the time taken to train the personnel servicing it. There is built-in equipment for monitoring and troubleshooting as well as connectors and sockets for hooking in monitoring-measuring instruments for simplicity of operation. According to existing specifications the system must provide for the functioning of 50 percent of radio nets at the end of a three-month continuous operation. The make-up of spare equipment was calculated based on this.

The ICS3 system consists of four basic functional subsystems: receiving (VLF [very low frequency]-HF bands), transmitting (MF [medium frequency]-HF bands), control and monitoring, and automatic message processing. The last two are fully compatible with communications equipment of the metric and decimetric wavebands as well as of satellite and underwater sound communications.

The RECEIVING SUBSYSTEM (10 kHz-30 MHz) provides telephone, telegraph and teletype communications over nets of tactical and strategic levels of control.

It is built according to the modular principle and includes three basic elements: antenna (Fig. 1 [figure not reproduced]), standard frequency generator and MF-HF receiver.

The small active wideband antenna (10 kHz-30 MHz) receives and amplifies signals which arrive at several receivers through a matched output and active wideband commutator and then are sent to the subscriber with the help of a control and switching system. Each receiver has satisfactory characteristics for suppressing cross modulation from a nearby transmitter even with a high field intensity.

The standard frequency generator provides a standard frequency of 1 MHz to all receivers, transmitter drives, and the "antenna-receiver" switching system.

The receiver has two inputs: one for 1-30 MHz band signals and the other for VLF, LF [low frequency] and MF. Reception is made on upper and lower sidebands as well as in the double-band telephony mode.

Every drive is coupled with a receiver, which creates opportunities for synchronous control with simplex operation on one frequency. This permits remote switching of channels and remote connection of the receiver to a drive. A receiver not coupled with a drive usually is used for receiving multiple-call, phototelegraphy and other transmissions.

The TRANSMITTING SUBSYSTEM (240 kHz-28 MHz) provides communications in the telephony, telegraphy, printer and data transmission modes at the tactical and strategic control levels (Fig. 2 [figure not reproduced]). An output of 100 watts is required for communications over short distances, 250 watts for medium distances and 700 watts for long distances.

Subscribers are connected to transmitters of the control and monitoring subsystem by commands arriving at its input and determining the choice of a radio channel and level of output power. The shaped and amplified radio signal is sent to the wideband combination transmitting antenna.

The transmitting subsystem is divided into a number of separate circuits connected to the combination antenna system. Each circuit consists of a drive, the output of which is connected via a commutator to a set of wideband power amplifiers connected in parallel. The output signal passes through a special circuit to the appropriate section of the wideband antenna system. This permits selecting the output power and simultaneously quickly tuning to the frequency without retuning the powerful output stages, and it reduces the permissible frequency spacing between signals.

HF antennas providing for operation in a greater part of the band are located on one of the ship masts. The antenna system's operating band can be decreased because of the height of masts. A small number of whip antennas is used for radio communications in the lower portion of the HF band and to 240 kHz. They are connected to separate transmitting circuits which include a drive, 100 watt or 1 kw power amplifier and an antenna circuit.

Transmitting circuits consist of separate transmitters aboard ships with small displacement and in systems where it is impossible to install a set of power amplifiers and wideband antenna system.

The receiving and transmitting subsystems have ZU [memory] which stores up to 19 frequencies for tuning, and an additional 12 frequencies can be input manually.

Each system of the ICS3 includes a 100 watt HF transmitter and receiver for use in emergencies (it can operate without conventional or emergency ac power).

The SUBSYSTEM FOR CONTROL AND MONITORING of the receiving and transmitting equipment (Fig. 3 [figure not reproduced]) provides for rapid entry into communications by a subscriber located in any spot on the ship. He is given means for telephone, telegraph or digital (LINK10 or LINK11) communications.

The basis of the subsystem is a panel located in the ship's central communications station. It includes a main switching matrix with button switches which permit any subscriber to be connected quickly to any radio net; a mimic diagram which reflects operating elements of the transmitting and receiving subsystems, the selected frequency and the output level; lights signaling the status of various devices; a retuning and control console for monitoring and displaying system status, as well as for conducting diagnostic tests and tuning antenna circuits. The panel also has a control console needed for controlling the equipment during operation on radio nets.

Communications lines each containing three pairs of wires (for transmission, reception and control) diverge from this panel to subscribers throughout the ship. Several such lines are connected with the combat information center (BIP) switchboard, from which they are distributed among subscribers. Each one has information about the status of communications equipment at his own panel.

The MESSAGE PROCESSING SUBSYSTEM (Fig. 4 [figure not reproduced]) was developed by the firm of MEL according to the modular principle. It allowed a sharp reduction in the number of manual operations, and one operator copes with the flow of telegraph messages aboard a frigate or destroyer (some 2,000 messages a day).

All messages are registered in the ZU on integrated circuits for prompt use and on magnetic tape for subsequent processing. Only messages selected by the operator are printed out using a high-speed mosaic printer device made by the firm of PEAB.

The telegraph subsystem has an MEL Type 99 microprocessor for military use (16 bit word length, ZU of 64 kilobytes) which can control three consoles simultaneously (each one designed for working with seven communications channels). The console contains a display device, buffer and control memory, magnetic tape ZU and keyboard for input and editing. The subsystem also

includes a special storage device for message headings, and monitoring equipment which continuously keeps track of a change in basic equipment parameters.

A subsystem aboard ships with small displacement has several printer devices and magnetic tape ZU.

6904
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NV-10 SHIPBOARD NAVIGATION EQUIPMENT

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 10, Jul 84 (signed to press 10 Jul 84) pp 71-72

[Article by Capt 3d Rank M. Karelin]

[Text] Precise and reliable navigation support is one of the important factors for successful performance of missions by ships at sea. As reported by the foreign press, the NV-10 shipboard navigation equipment developed in 1981 by the British firm of Rediffusion Radio Systems began to enter the British Navy in late 1982. It is installed aboard hydrographic vessels and supply transports.

The NV-10 is intended for determining current values of a ship's position in the form of coordinates from combined data of the NNSS satellite navigation system (SNS) (Transit) and the Omega radio navigation system (RNS). This is achieved by using their advantages--the high accuracy of the SNS and continuous operating mode of the RNS. Basic deficiencies also are eliminated--the time discreteness of observations on the SNS and low accuracy of observations for the RNS.

The mean-square error for determining a vessel's position is 100 m, with another 360 m added to this amount with consideration for her movement during an observation on the SNS for each error point in determining speed.

The NV-10 equipment set (see figure [figure not reproduced]) includes receiving and data processing, control and display units as well as an antenna device. The receiving and data processing unit is the basic unit. It includes receivers of the SNS and Omega RNS radio signals, a highly stable pedestal-frequency generator, and microprocessor.

The SNS receiver separates navigation data from the SNS radio signals transmitted on a carrier frequency of 399 and 968 MHz. The Omega RNS receiver operates on four frequencies (10.2, 11.05, 11.33 and 13.6 kHz), and in the rangefinding mode circular lines of position are obtained based on results of measurement of the time it takes signals to pass from shore RNS stations. Data from RNS and SNS receivers enter the 16-bit Texas Instruments TMS-9900 microprocessor, which performs navigational calculations. In addition, data from the log and gyrocompass enter the microprocessor through built-in

analog-digital interface devices. It takes around 10 seconds to compute the vessel's position after receiving data from the satellite (for at least 6 minutes). Information on the vessel's location are updated every 10 seconds from the RNS.

The main unit (50x40x31 cm) can be accommodated in any ship's house at a distance of up to 65 m from the antenna. It is connected with the antenna and with the preamplifiers mounted on it by means of a coaxial cable. In contrast to other types of navigational equipment the NV-10 uses a standard antenna (2.4 m whip) for receiving SNS and RNS radio signals.

The control and display unit includes a display in the form of a cathode ray tube and keyboard consisting of 24 keys for inputting initial data, correcting them and controlling the equipment's operation. Data are reproduced on the display in the form of one of ten "pages" by punching in an appropriate code on the keyboard. In particular, basic navigation data (latitude and longitude of the ship's position, time, course and speed) are contained in the first "page," with the others containing coordinates of points on the route and showing tracks to them (Mercator and Great Circle bearings and distance), data of the last satellite observation, forecast of the next satellite passes in the zone of radio visibility (satellite number, time, maximum angle of elevation), characteristics of radio signals being received from the satellite and shore RNS stations, and so on. In the opinion of foreign specialists, the opportunity for precise calculation of the vessel's movement to a given point considerably improves the effectiveness of an observation at sea.

When operating in the primary mode the NV-10 equipment determines the ship's current position using Omega RNS data in the intervals between observations based on satellite signals. Coordinates are adjusted during a subsequent observation (with consideration of the data input from the log and gyrocompass). In another work mode data from the log and gyrocompass are taken into account in computing the ship's location between satellite observations. In addition, there is a mode for working out the "most probable coordinates" as a weighted mean value of observation results on the SNS and RNS as well as of the reckoning.

Automatic monitoring of equipment serviceability is provided by a special control test two hours from the moment of an SNS observation (and if a satellite is not expected to pass within the zone of radio visibility for the next ten minutes). The average time for locating and eliminating a malfunction (by changing modules) is around 30 minutes. In case of an emergency on the ship's power network a built-in storage battery supports the equipment's operation for the next 15 minutes. A supplementary miniature battery maintains power for a long while for that part of the microprocessor memory module where data necessary for the equipment's operation are stored. The rated input is 45 watts.

Portable displays, remote control units and a recorder can be connected additionally to the set. It is possible to connect Decca and LORAN RNS receiver display equipment to the microprocessor. According to the firm's specialists,

after slight modification the NV- equipment will be able to determine a ship's position from NAVSTAR SNS radio signals (it is expected to become operational in 1988), which possibly will become a standard navigation system for the NATO armed forces.

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FORWARD-LOOKING INFRARED SYSTEM IN U.S. NAVY AIRCRAFT

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 10, Jul 84 (signed to press 10 Jul 84) pp 72-74

[Article by Col M. Panin]

[Text] At the threshold of the 1980's the U.S. Navy command began to introduce infrared [IR] target acquisition and missile guidance systems aboard the aircraft of Naval Aviation. At the present time deck-based A-7E Corsair and A-6E Intruder attack aircraft as well as P-3C Orion land-based patrol aircraft in the U.S. Navy are outfitted with AN/AAS-36 FLIR forward-looking infrared systems (Fig. 1 [figure not reproduced]).

The heat-emitting object and its surrounding background form a heat field in the IR spectrum (a wavelength of 8-14 microns). It is within these limits that the sensitive element detects IR emissions. A constant image of the terrain background is formed as a result, where objects with thermal emissions having varying intensity stand out. They may be "warmer" or "colder" than the overall background of terrain (or sea surface). The IR system is capable of detecting targets despite darkness or the presence of haze, smoke and camouflage. Inasmuch as humidity in the air (dense fog, clouds, rain) absorbs and disperses radiant energy, however, the system's effective range is considerably reduced under such conditions.

An IR detector which picks up a target's thermal emission is the central element of the AN/AAS-36 FLIR system. It is an array 25 mm in diameter consisting of 180 mercury-cadmium-tellurium sensitive elements (Fig. 2 [figure not reproduced]). The array is contained in a vacuum chamber and cooled to -196°C by a liquid nitrogen cryogenic device. The thermal emission comes from the vicinity of a target, it is focused by telescopic optics on one of the sides of a two-sided scanning mirror and, after reflecting from it, hits the detector, which converts the IR energy into electrical signals, converted and amplified by a video amplifier. Then they enter a matrix of light-emitting diodes and are converted to video signals. The visible image from the matrix is formed by the reverse side of the scanning mirror and is projected on the input optics of a transmitting television camera, where the signals again are amplified and converted to a standard television video signal, and the target is displayed on the aircraft's television display with an 875 line scanning

pattern (Fig. 3 [figure not reproduced]). Image brightness and contrast can be adjusted.

The forward-looking IR system aboard U.S. Naval Aviation aircraft permits viewing the entire lower hemisphere ahead of the aircraft. An input receiver device with sensitive element is mounted on a gyro-stabilized platform and can scan ±200° in azimuth and from +15° to -82° in elevation.

A turret (around 50 cm in diameter) is mounted beneath the nose radar antenna fairing on deck-based A-6E Intruder attack aircraft on which the FLIR system receiver, laser transceiver and laser receiver are installed. All these subsystems are coordinated with the aircraft's longitudinal axis and with the radar crosshairs. Targets are displayed on the pilot's and navigator's displays.

The effective range of the airborne IR system permits a crew to attack the target on the first pass without a preliminary overflight for identification and updating of initial data, but the range is less than for a radar. For this reason, after initially detecting a target on the radar scope, the navigator gives the pilot a command to execute a turn to the target and switches on the FLIR system at the estimated effective range. To identify a given target in a ship order the navigator uses an optical transfocator, which amplifies its infrared image on the set display. Then he manually lines up the display crosshairs with the target image and turns on the autotracking mode. The UR [guided missile] homing head, which has an IR system similar to and coupled with the onboard system, locks on the target and automatic tracking begins. After this the missile can be launched at a certain distance from the target and the pilot must execute an evasive maneuver and leave the area. According to American military press reports, the UR with IR guidance system permits delivering strikes on the most vulnerable parts of a ship--the waterline or the engine compartment.

The main IR subsystems in American A-7E Corsair attack aircraft are accommodated in a suspended pod on one of the starboard pylons. They include an infrared receiver, servosystem, cooling device and video tape recorder monitor. Switches and controls are in the cockpit.

In the opinion of foreign military specialists, the FLIR systems make it easier to pilot aircraft at extremely low altitude above the sea at night and permit effective use of weapons. They presently are undergoing tests in the new A-18 Hornet deck-based attack aircraft.

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ELF COMMUNICATIONS WITH SSBN'S

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 7, Jul 84 (signed to press 10 Jul 84) p 74

[Article by Col (Res) A. Ivanov: "U.S. Development of System of Communications with SSBN's at Extremely Low Frequencies"]

[Text] Work continues in the United States to develop an abbreviated version of a communications system with SSBN's operating in the extremely low frequency band (40-80 Hz), consisting of two transmitting centers. Previously under the Sanguine Seafarer program it was planned to deploy several tens of transmitting devices with a varied antenna array over an area of 4,000-5,000 km^2. In the presence of a sufficiently powerful transmitter, radio waves of this band propagate to a range of more than 10,000 km and, of special importance, they are capable of penetrating hundreds of meters of sea water, providing secrecy and invulnerability for a submarine in the radio reception of commands and instructions of the U.S. military-political leadership.

One of these centers has been functioning since the 1960's (a test center in the state of Wisconsin with a 50-km antenna). It now is being modernized, after which it will provide communications with SSBN's in the Atlantic Ocean. A second center (with a 100-km antenna) is planned to be built in the vicinity of Lake Michigan. It is to provide communications with SSBN's in the Pacific. The antenna-feeder devices will be fastened to supports not far above the ground for the purpose of saving resources and for the purpose of servicing the system.

In the opinion of American specialists, a deficiency of the system is a low rate of data transmission, figured in minutes. For example, during tests to establish radio communications between the transmitting center and a submarine located 2,000 km away it required several minutes for transmitting a three-group telegraph message. It is planned to allocate $230 million for building such a system of communications with SSBN's, completion of which is expected in the late 1980's.

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SOVIET TROOPS HELP AFGHANS BUILD ROADS

LD221927 Moscow Television Service in Russian 1530 GMT 22 Dec 84

[From the Vremya newscast: Video report from Kabul by B. Savodyan]

[Text] Sundays are work-days in Afghanistan. The day off here is Friday. It was on a Friday that we visited one of the poorest districts of Kabul--the old town. Much of the old is indeed still here, but the new is making inroads too. This becomes primarily evident in people's consciousness.

Thousands of Kabul inhabitants--industrial and office workers, soldiers--responded to the appeal by the city's party leaders on the eve of the 20th anniversary of the formation of the PDPA to participate in improving the environment of their town district. A 7-kilometer asphalt road will be built here. [video shows town location with earth-moving work in progress using heavy machinery, crowds of Afghans largely as onlookers, banners with slogans, and a couple of Soviet soldiers shaking hands with the locals] For the moment, it is necessary to clear up and level the ground. Soviet servicemen have come here to help in this work. They are being received here as friends. This is a custom rooted in the distant past of the Afghan people--they get together to work in common effort on the land, to gather in the harvest, to build a house or a well, Afghanistan--marching forward into the new life--maintains this tradition of the people as sacred. [video shows Savodyan interviewing an Afghan bulldozer-driver named Aka Mukhamed, in Dari with superimposed Russian translation] [Mukhamed] I take part in the building of this road with great joy. I am not working for money, but for the good of my people, for the good of the revolution which is doing everything to improve the living conditions of ordinary Afghans.

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